

The Mining Journal

LONDON, FEBRUARY 5, 1960

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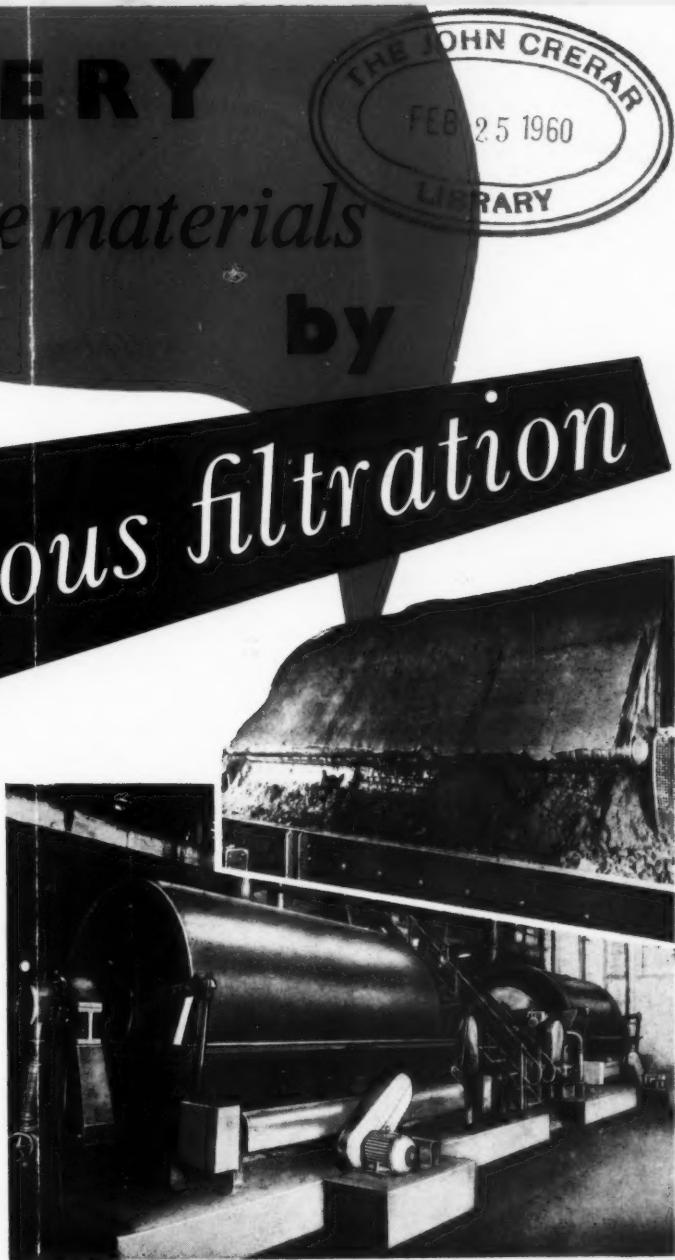
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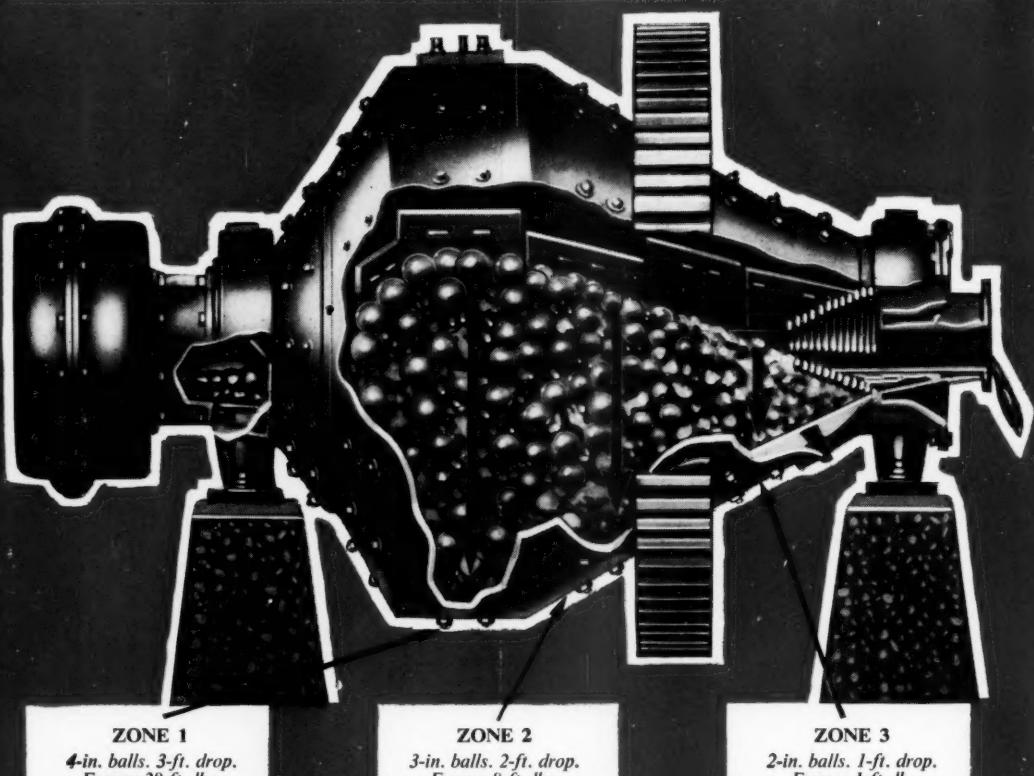
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International NU-SWIFT News

No. 2

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21. BRITISH EXPORTS of fire extinguishers are the highest in the world. Total value of NU-SWIFT exports is increasing continuously. Last year they amounted to NEARLY ONE-THIRD OF THE BRITISH TOTAL.

22. In arctic SPITZBERGEN (Norwegian : SVALBARD), divided by an invisible iron curtain, but where Norwegian and Russian workers fraternise, the NORWEGIAN COLLIERIES of STORE NORDISKE SPITSBERGEN KULKOMPAGNI are protected by Nu-Swift.

23. THE ROYAL CANADIAN NAVY, which in 1947 standardized on the Nu-Swift Universal Water/CO₂ Extinguisher, has placed further orders.

24. HAILE SELASSIE, H.I.M. of ETHIOPIA, is reported to take a keen interest in fire extinguishers. Nu-Swift has been approved and the first consignments have been sent to ADDIS ABABA.

25. Since MOROCCO gained her independence, a Nu-Swift sales concessionnaire has been appointed and the first supplies of extinguishers have been shipped to glamorous CASABLANCA.

26. Narrow and winding alleyways in the ancient town of ST. GEORGE, first British settlement in now fashionable BERMUDA, sometimes prevent the Fire Brigade from getting close enough for effective fire fighting. Fire engines are therefore fitted with extinguishers to enable firemen to fight inaccessible fires with reliable Nu-Swift.

27. A.T.A.C. the MUNICIPAL TRAFFIC COMBINE of the City of ROME, and reputed to be the largest surface passenger transport organization in Europe has decided after tests extending over two years, to standardize on Nu-Swift.

28. YUGO-SLAVIAN STATE OWNED CORPORATIONS are among the Nu-Swift customers situated on the edge of the East-West iron curtain.

29. In HELSINKI, capital of gallant little Finland, and almost within a taxi ride of Leningrad, the FINNISH POSTS AND TELEGRAPHS DEPARTMENT have decided to standardize on Nu-Swift Dry Powder extinguishers, especially suitable for use under severe arctic conditions, common each winter in Northern Finland. Substantial orders have already been placed.

30. GERMAN SHIP OWNERS are now also able to fit Nu-Swift in their ships, thanks to the approval of the SEE-BERUFSGENOSSENSCHAFT in Hamburg.

31. At TULLN, Austria, in the presence of high ranking Austrian fire-fighting officials, including BRAND-DIREKTOR DUFEK, Chief Fire Officer of Vienna, two Nu-Swift Dry Powder Extinguishers, Model 1604, bonded for 2 years for reliability tests were recently discharged. They passed with flying colours and OBER-BRANDRAT SPEIL, the official responsible, signed the certificate of approval on the spot.

32. The Government of the FALKLAND ISLANDS, British sheep-farming colony in the South Atlantic, near Argentina, recently placed their first Nu-Swift order. Sheep vastly outnumber human inhabitants in the Colony, previously of great strategic importance, but GREASY WOOL has high fire risk.

33. INDEPENDENT TELEVISION AUTHORITY, always in keen competition with the BBC, is determined that programme transmission shall never be interrupted through preventible causes. All its stations are now protected by Nu-Swift.

34. Reputedly being let at £25 a day or more, NEW LUXURY SUITES on the top floor of the DORCHESTER, London's premier Park Lane Hotel, are protected by Nu-Swift.

35. The up-to-date works of ALFA ROMEO, the well-known motor car manufacturers in NORTHERN ITALY, have recently been equipped with Nu-Swift. Crash tenders too have been fitted with fast and reliable Nu-Swift.

36. In NASSAU, BAHAMAS, eldorado of all YACHTING AND DEEP-SEA FISHING enthusiasts, many of the YACHTS are equipped with Nu-Swift.

37. PRINCESS BENEDIKTE, teenage daughter of the King of Denmark, recently launched a large train ferry named after her at ELSINORE close to the legendary home of Hamlet. Required urgently by the DANISH STATE RAILWAYS to cope with increase in cross-water traffic, the ferry was equipped with Nu-Swift.

38. The Trustees of SHAKESPEARE'S Birthplace in STRATFORD-ON-AVON, conscious of the dollar-earning value of the Bard's home, has protected the property with Nu-Swift. Last year the house was visited by over 200,000 sightseers.

39. H.M. THE KING OF SWEDEN has had Nu-Swift fitted in his cars and other vehicles. On board H.S.M.S. 'TRE KRONOR,' Sweden's premier man of war, his Majesty is similarly protected. Three other reigning Sovereigns are also protected on board their yachts by Nu-Swift.

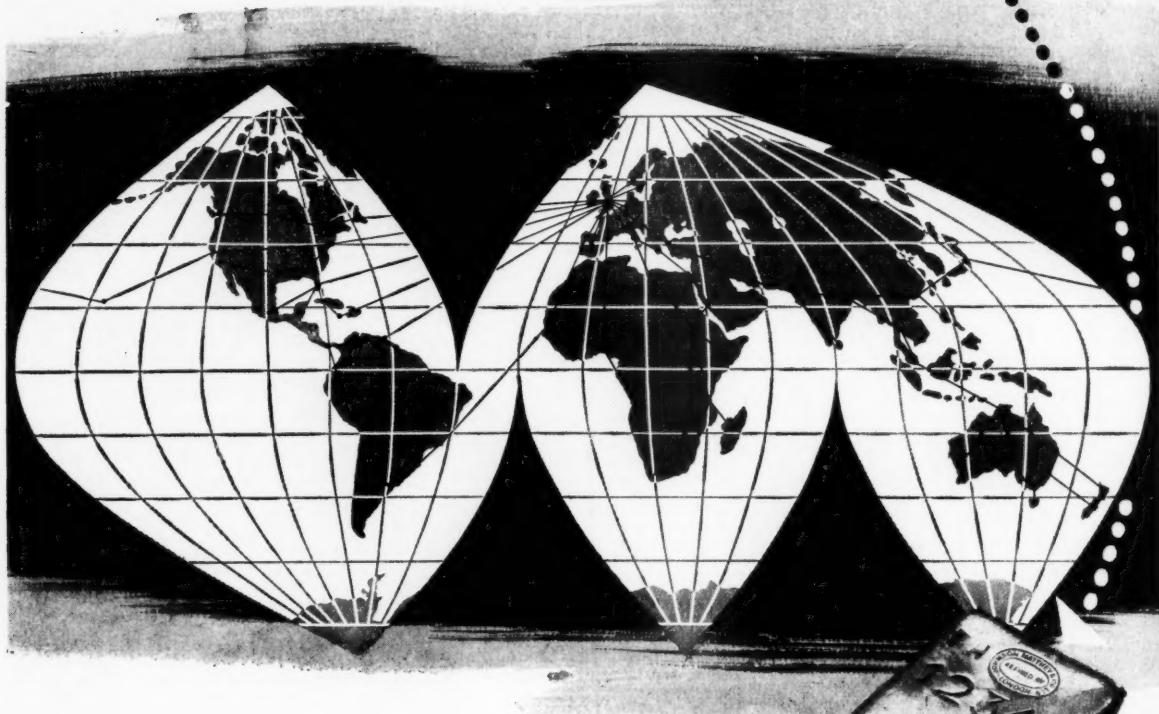
40. ESSO RESEARCH, LTD. have equipped their new offices at ABINGDON, BERKS., ENGLAND, with Nu-Swift.

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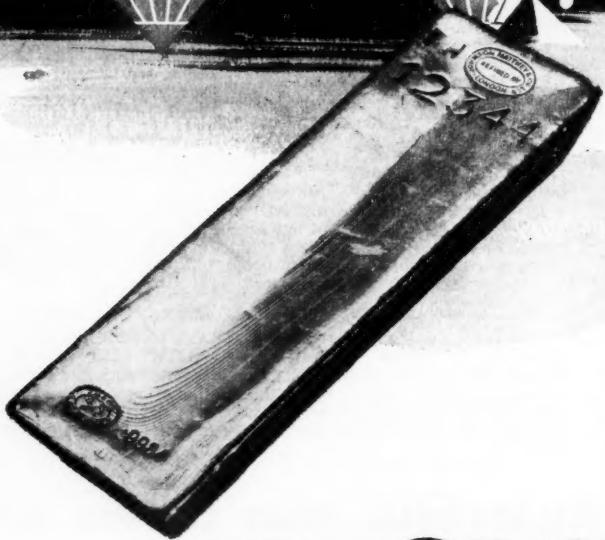
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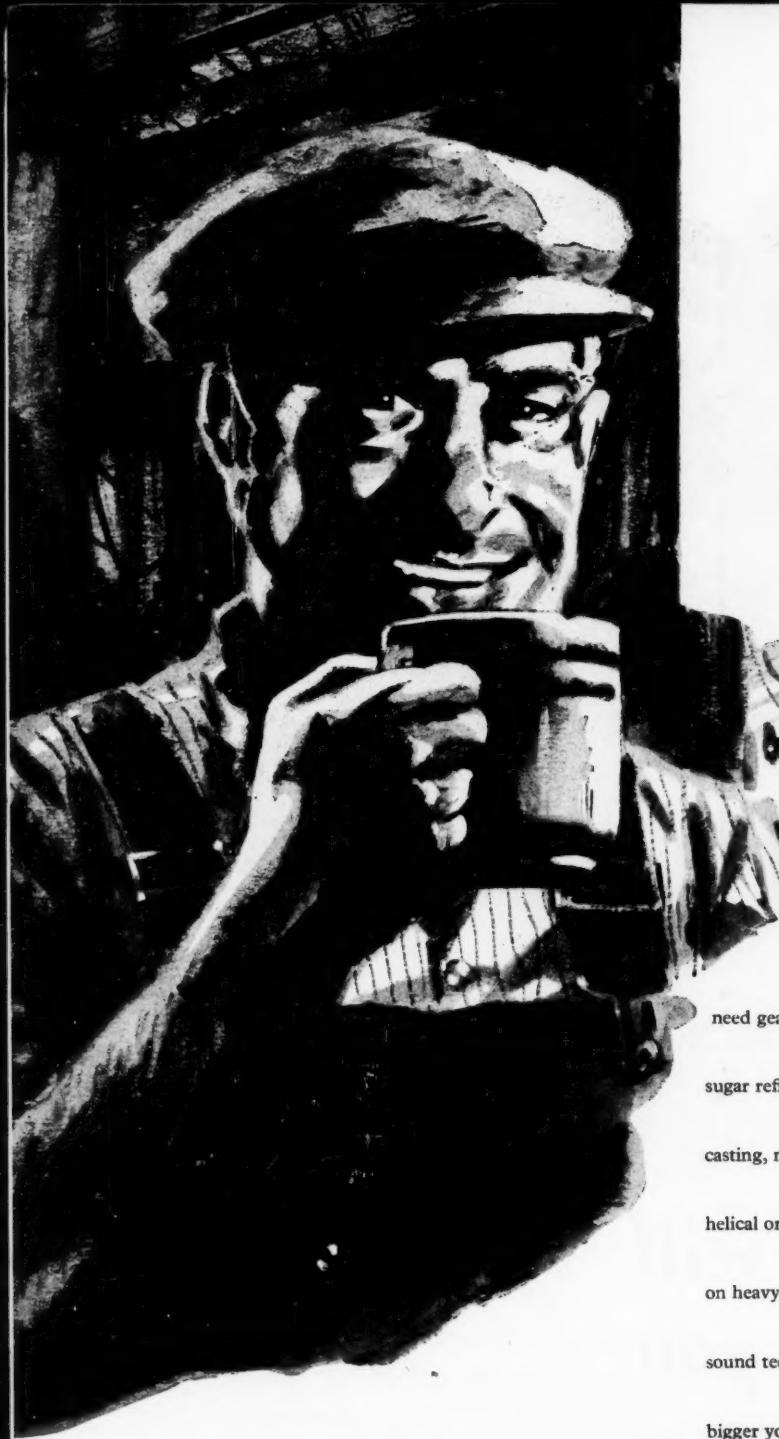
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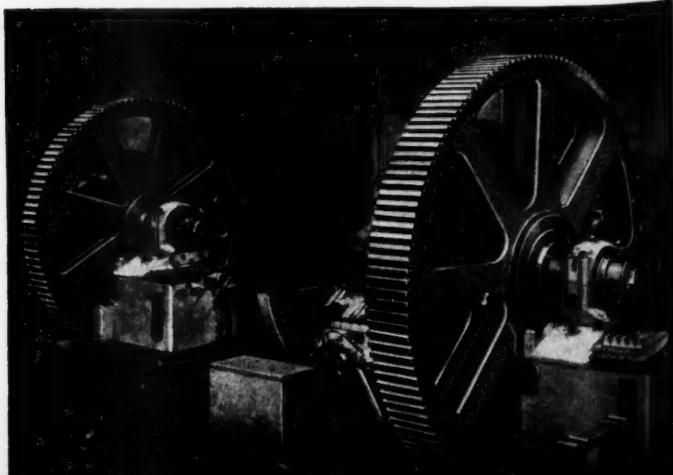
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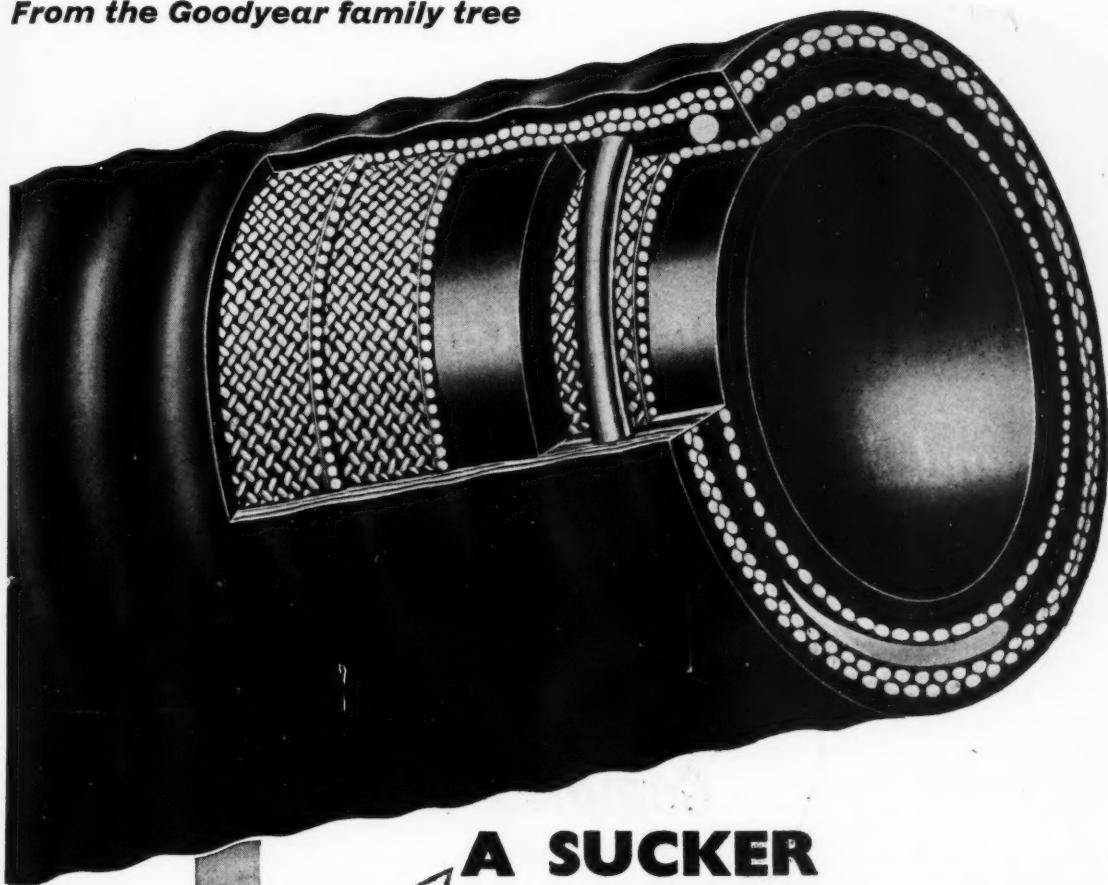
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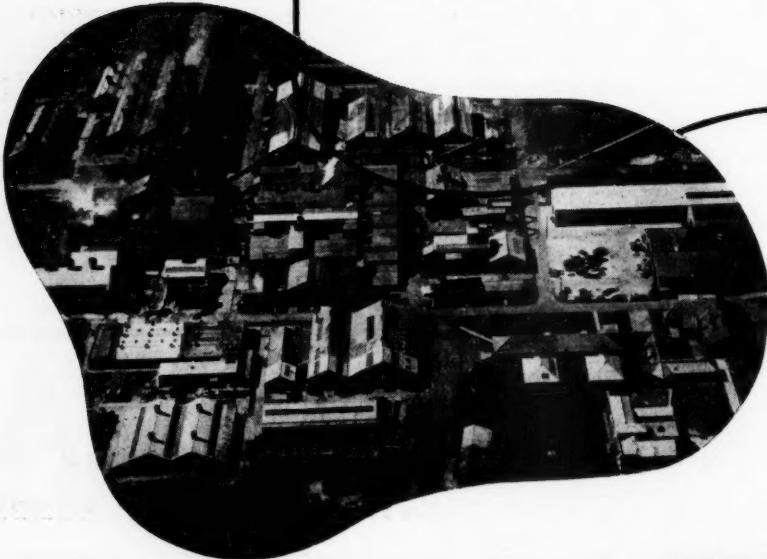
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The Mining Journal

London, February 5, 1960

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Prospects for the Ferroalloy Metals

BETWEEN the years 1945 and 1957 inclusive, the annual world production of ingot steel rose from 113,000,000 to 278,000,000 l.tons. This remarkable rate of expansion, never surpassed by any other basic industry, resulted in steadily expanding markets for the various metals used in the steel industry, and with stockpile demands continuing, available supplies were inadequate to satisfy civilian requirements fully. Under the stimulus of high prices and Government stockpiling programmes, however, Free World production was expanded so rapidly that by 1957 shortages had begun to disappear. Chrome ore was more freely available and in reduced demand, cobalt had become plentiful, manganese producers were encountering more difficult marketing conditions for metallurgical ore. By the end of 1957 the combined supply of market and premium price nickel had been brought into close balance with demand for the first time for a very long period.

Then came the steep decline in steel production during 1958, when U.S. output fell to little more than 50 per cent of capacity. Coming, as it did, at a time when markets for most ferroalloy metals had already begun to weaken, this abrupt end to the long period of expanding consumption resulted in saturated markets and sharply falling prices. The London price of wolfram, which in March, 1956, had reached a peak of 675s. per l.ton unit c.i.f., touched bottom in September, 1958, at 62s. 6d., and many mines brought into production as a result of the high prices ruling during the Korean War were compelled to close down.

The past year brought the end of the recession and today the steel industry, now that the long U.S. strike is over, is again operating at or near peak capacity in virtually all Free World countries. The price of wolfram has recovered to 155s.-160s., while the chromite market shows signs of recovery. Manganese ore stocks are still heavy, but the outlook is gradually brightening as industrial activity expands.

Particularly encouraging are two year-end reviews of the ferroalloy industry in the United States, emanating respectively from the Business and Defence Services Administration, U.S. Department of Commerce, and Mr. H. K. Intemann, president of the Union Carbide Metals Co., division of Union Carbide Corporation.

According to the B.D.S.A., the production of ferroalloys amounted to approximately 1,200,000 s.tons in the first half of 1959, being 51 per cent above the figure for the same period of 1958. As a result of the steel strike, production in the last half is expected to amount to only 750,000 tons, making a total of 1,950,000 tons for the year. This annual rate exceeds that of 1958 by 13 per cent, but is 26 per cent below the peak 1956 rate.

Output is expected to continue its rise throughout 1960. Assuming that the steel industry operates at an annual rate of 125,000,000 net l. ingot tons through 1960, it will require approximately 2,625,000 s.tons of ferroalloys. On this premise, the ferroalloy industry will produce approximately 2,700,000 s.tons of ferroalloys, exceeding the present all-time peak by 2 per cent.

If the predicted rise in the demand for ferroalloys takes place, the question arises as to whether adequate supplies will be available. This question is answered in the affirmative by Mr. Intemann, who states that the U.S. domestic alloy production has more than sufficient capacity to meet the requirements of the steel industry when operating at full capacity. It is further pointed out that world-wide alloy production capacity is considerably in excess of world consumption.

Mr. Intemann observed that in previous years government stockpiling had taken a percentage of the domestic ferroalloy industry's product. This is no longer a factor, he stated, since government purchases from these producers for stockpiling of alloy additives have dwindled to mere token amounts. However, foreign producers are still supplying ferroalloys and pure metals for the stockpile. It is a fact, he added, that much of the new foreign capacity was installed to supply alloys to the U.S. strategic stockpile under the barter programmes established since World War II.

There is a familiar ring in Mr. Intemann's statement that the domestic ferroalloy industry is facing serious competition from these modern plants, which are operating with materially lower labour costs and are offering alloys in the United States appreciably below domestic prices for the same products. Import totals for the year 1959, it was stated, might easily reach 12 to 13 per cent of the total U.S. domestic market for some products—the highest in history. It remains to be seen to what extent this situation will result in growing pressure from U.S. manufacturers for increased protection against competition from overseas.

So far as the immediate future is concerned, there can be little doubt that, barring any unforeseeable setbacks, U.S. imports of ores and metals for the ferroalloy industry will be substantially higher during the coming year, and that this gain will be paralleled by higher consumption in Britain, the Continent and elsewhere. Also, encouraging for Free World producers, if perhaps in a more negative sense, is the phenomenal rate at which steel production is being expanded in most Communist countries, whose own growing requirements for the ferrometals must have an increasing significance in the overall pattern of world supply and demand.

On the subject of technical advances, Mr. Intemann pointed out that refinements of steel production techniques had meant an increased emphasis on quality of ferroalloys. In many cases, the metal-melting industries have required removal of elements to the extent of leaving residuals in parts-per-million where formerly parts-per-hundred were permitted. To meet these new demands, leading producers of ferroalloys have turned to vacuum furnace production to refine and purify many of their products. This is a technique of which much more will be heard in the coming years.

AUSTRALIA'S INDUSTRIAL FUTURE

Australian industry faces a difficult future resulting from recent decisions by the Commonwealth Conciliation and Arbitration Commission. The first award in recent weeks was an increase of 15/- per week in the basic wage. This in itself is a sufficiently heavy blow to industry, and particularly to mining which faces a period of difficult production and market conditions. This setback has been followed by the margins decision, which provides for an increase of 28 per cent in margins for skill.

This award, coupled to that of the basic wage, places all industries in great future difficulty. On the side of secondary manufacturing industries, Australia has industrialized very rapidly, and it is impossible for the domestic population to absorb the rapidly increasing products. Export is imperative, and the future cost position will be such that Australia will be priced out of the world's competitive markets. The impact

of greatly increased costs, resulting from basic wage and margin increases, will be no less heavy on mining stores, materials, machinery and the numerous other essentials.

It is argued that prosperity will permit absorption of the increased charges by industry. Mining cannot do so. That industry faces a very difficult future in stockpiles of metals, overproduction and dull, competitive markets. Lead, zinc, silver and tungsten, together with rutile and zircon, are sufficient examples. Copper, alone amongst the base metals is reasonably stable with the support of the Government bounty. The outlook for gold becomes still more precarious than it has been. But the problems do not end with the recent awards. The Victorian gold mining industry is faced with an increase in margins of 41.6 per cent and this will ultimately be adopted as the pattern for increased margins in the mining industry. Further, the various unions are dissatisfied with the rate fixed for margins, and action is forecast for their review and also for a review of the basic wage and restoration of quarterly adjustments, the removal of which has at least given some stability to the wage factor. The unions intend to campaign for a 35-hour working week in place of 40 hours, and the move has already commenced.

Mechanization and efficiency in the mining industry have reached a high standard that leaves little room for any appreciable contribution to cost reduction. Coal mining is capturing east Asian markets because of the good costs it has achieved, but this hard-fought-for market, against keen competition, could well be lost in the new circumstances. At Broken Hill a new industrial agreement is being discussed; the future of the field is gloomy, unless new union demands are refused and there is modification in existing conditions and restrictions. The industrial spiral has taken on new growth, and inflation seems to be regarded as prosperity.

SHIPMENT OF BRITAIN'S IRON ORE NEEDS

In line with the post-war development programme of the British steel industry, every phase of material supply and plant capacity has had to rise correspondingly and the supply of iron ore has similarly brought its own problems. For example, home produced ore is low grade but cheap compared with imported ore and efforts are being made to increase the supply. The industry must continue, however, to rely for its expansion, as on the Continent and in the United States, on imported ore, which is also much richer in iron content than is home ore. The quantity imported in 1958 was 16,000,000 tons and by 1962 the total is expected to be over 22,000,000 tons.

With the prospect of this continued increase, the entire question of importing iron ore was examined by the industry with a view to determining the most economical means of handling, transporting and discharging ore.

As a result of the investigation, recommendations were made regarding methods of unloading and optimum numbers of berths for given tonnages handled at any port; in addition, the complementary aspect of sea transport was also studied. The rapid increase in imports in relation to the probable shipping tonnage available showed that, in addition to long term charters, the iron and steel industry should participate in financing purpose-made iron ore carriers which, for economical operation, should be the largest practicable and should have a quick turn-round.

The problems involved and the possibilities for their solution were reviewed last year by Dr. J. S. Terrington, of the British Iron and Steel Research Association in a contribution to *International Design and Equipment*. Apart from comparing the actual methods of handling ore, such as types of unloaders at ports, and assessing relative costs of unloading, one of the major results of the investigation showed that it was possible to classify existing ports in terms

of their availability to ships of different sizes as determined by depth of water and limitations to length and beam due to lock and dock dimensions.

The depth of water at iron ore ports in this country, with few exceptions, is considerably less than that at iron ore ports in America and Europe. In addition to depth of water, many ports in Great Britain have limitations on permissible length and beam of ships. The result is that, from the point of view of standardization of ship sizes best suited to serve the British ports, sizes up to about 22,000 d.w. only are possible. At present, however, there are only a few ports which will take ships of this size. In fact, ore carriers built or on order in the United Kingdom are either about 9,000 - 10,000 tons or 15,000 - 16,000 tons, whereas European ships range up to 33,000 tons and American carriers up to 58,000 tons. Thus, in this country, although more carriers are coming into service (by 1962 the fleet under the industry's control will number over 70 ships with an annual carrying capacity of about 11,000,000 tons), the size ranges will be comparatively moderate, *viz.* up to 16,000 tons d.w., unless policy is changed.

Two possible tendencies may be discerned. The first is the development of moderately large ships up to 35,000 - 40,000 tons, serving as many (improved) home ports as possible, coupled with other sizes of 10,000, 16,000 and 20,000 tons, all plying directly between ore loading ports abroad and ore reception ports in Britain. Alternatively, there might be a shuttle service of very large ships of 50,000 - 100,000 tons d.w. materializing, as in the case of the projected scheme at Milford Haven. However, fewer ships of up to 16,000 tons would ultimately be required since these smaller sizes would serve the function of coasters to carry ore from the terminal of the very large ore ships of 50,000 - 100,000 tons to the existing individual ore reception ports, and moreover only relatively few of the 50,000 - 100,000 tons ships would be needed.

At the present time, states Dr. Terrington, it is not at all certain which of these two conditions will predominate, but there is no doubt that before the second can be put into operation, the cost of transhipment and/or that of handling into and out of a central stockpile must be justified.

PAKISTAN'S SECOND FIVE-YEAR PLAN

In a recent nationwide broadcast, Field-Marshal Ayub Khan gave an outline of the targets aimed at during the next five-year plan, which will run from 1960 to 1965. The plan places special emphasis on further exploration and prospecting in the areas which are known to contain valuable minerals. Attention will be given to increasing the output of coal from the present output of about 750,000 tons per annum to 1,500,000. The Pakistan Industrial Development Corporation is expected to provide most of this increase. This Corporation will undertake the development of two deep-level adits into the Sor Range some 5,000 feet long. Each of these is expected to handle 1,000 tons per day when the coal-seams served by them, are fully developed. In addition this Corporation is expected to bring the production of the Deghri Mine, now producing about 120 tons per day, up to 500 t.p.d. Private companies will be encouraged to increase their productions compatible with the conditions prevailing in the various existing mines. Areas, such as Jhimpir (Sind) and Salt Range, will be investigated with a view to increasing their contribution.

More industrial concerns will be encouraged to change to natural gas as a power supply, and as many new ones as possible will be persuaded to install it. In this way consumption is likely to rise from the present 25,000,000,000 cu. ft. to over 100,000,000,000 cu. ft.

It is proposed to set up a Development Corporation, similar to the P.I.D.C., to investigate, and initiate the exploitation of mineral deposits not being developed by private enterprise. These will, in all probability, include marble deposits in the Peshawar-Nowshera area, gypsum in various areas, and such minerals as beryl, bentonite and other clays, which are known to occur, but have not been developed on a commercial scale.

The total cost of this mineral development programme during the 5-year period, is estimated to be Rs 670,000,000 of which one-third is from Pakistan sources, the rest from Foreign Exchange.

BUREAU OF MINES RESEARCH IN 1959

The achievements of the U.S. Bureau of Mines in coal, petroleum and other minerals research, helium production and health and safety were reviewed by the Secretary of the Interior, Mr. Fred A. Seaton, in his annual report to the President for the 1959 fiscal year, in which the following outstanding accomplishments were among those specially mentioned.

Coal: The Bureau began an ambitious study to determine whether hydraulic methods could be employed successfully in the United States to mine bituminous coal. Another new project seeks techniques for removing explosive methane gas from coal seams in advance of mining. Anthracite research included an experiment in mining a thick, moderately pitching vein of coal mechanically, and continuation of a full-scale longwall mining test.

Coal-preparation studies emphasized improvement of methods for cleaning bituminous coal, especially the fine sizes that usually do not respond well to mechanical treatment. Nuclear radiation also was used to gain more knowledge of the fundamental properties of both bituminous coal and anthracite.

Health: A Bureau-devised, portable mining shield was made available commercially, and a pocket-sized methane detector was developed. Co-operative studies with industry moved closer to an automatic methane-monitoring system for use on electrical equipment in coal mines.

Production of safety-education films for mineral-industry workers was intensified, and approximately 10,000 persons completed the Bureau's various accident-prevention courses. The Bureau's 246 Federal inspectors made nearly 12,000 inspections of the Nation's coal mines.

Metallurgy: Pioneering experiments by the Bureau of Mines created shaped molybdenum castings that are expected to speed space exploration and missiles development. High-purity tungsten and yttrium metals were obtained by Bureau metallurgists on a laboratory scale, new economies were attained in hafnium production, and the Bureau began a commercial evaluation of its electrolytic process for recovering high-purity titanium from scrap and other materials.

Other Bureau attainments in this field were successful experiments in which both coal and natural gas were used as iron blast-furnace fuels, and production of low-nickel austenitic stainless steel from off-grade ores. Research on non-metallics advanced with studies of super refractories, elemental boron, and asbestos.

Mining: New knowledge was gained in studies of blasting techniques and rock breakage, and progress was made in research to find ways of utilizing submarginal phosphate-rock deposits.

Foreign Activities: Bureau specialists gave technological aid in mineral development to 15 friendly countries, and 25 foreign scientists and engineers trained at Bureau establishments during the year.

MILLING TUNGSTEN ORES

TUNGSTEN, an important strategic metal, finds its largest commercial outlet in the production of high-speed tool steels and of corrosion and wear-resistant alloys. Other major uses are in the production of tungsten carbides and as a filament in electric lamps and electronic tubes. Tungsten is also coming into increasing prominence as a high temperature material. Alloys containing this metal resist oxidation at high temperatures and have played a key part in the development of modern aircraft.

U.S. domestic production of tungsten comes from many deposits in 17 states, but between 1900 and 1956 more than 80 per cent was mined in North Carolina, California, Colorado and Nevada. The average tenor of the mined ore was less than 1 per cent tungsten trioxide (WO_3).

Various milling methods, including gravity, flotation, magnetic separation and a combination of these produce concentrates that contain from 50 to 70+ per cent WO_3 . Slimes that are difficult to treat by these methods are usually processed chemically, with lower grade material, to produce synthetic scheelite containing 70 to 72 per cent WO_3 .

Characteristic of the economic tungsten minerals are their high specific gravities, which range from 5.4 for scheelite to 7.5 for wolframite. They are two to three times as heavy as quartz and this wide difference in specific gravity facilitates the separation of quartz, calcite and other lower specific gravity minerals by gravity concentration. Each of the wolframite series minerals has a perfect plane of parting (cleavage) in one direction. Scheelite has eight planes of parting, four being pronounced and four not.

Tungsten ore-dressing or milling methods vary according to the nature and characteristics of the tungsten minerals present. Milling tungsten ores free of other heavy mineral is relatively simple; refractory or complex ores need to be studied for the development of suitable methods. The presence of pyrite, arsenopyrite, pyrrhotite, sphalerite, calcite and apatite affects milling and the production of an acceptable concentrate. Ore-dressing is also made more difficult by the presence of recoverable subsidiary minerals containing tin, molybdenum and bismuth. Tungsten ores from the same general area may also vary in composition and characteristics.

Most tungsten deposits are low grade, the tenor of ore that can profitably be concentrated depending on the market value of the concentrate per unit of tungsten and the amenability of the ore to concentration. A concentrate of at least 60 per cent WO_3 is aimed at, though this may occasionally result in lower recovery of tungsten. For scheelite ores treated by gravity and flotation processes, 60 to 65 per cent recovery is considered fair, 80 per cent good and over 90 per cent exceptional. With wolframite ore, 70 per cent recovered is considered fair and 80 to 90 per cent exceptional.

Normally, the higher the grade of mill feed, the higher is the percentage of extraction that can be expected, though lower grade, more amenable ores sometimes produce more tungsten trioxide per ton of ore treated.

Tungsten ores are beneficiated by crushing and grinding to liberation size of the tungsten minerals, followed by gravity and/or flotation concentration and leaching, roasting and magnetic separation of the concentrate.

Crushing and Grinding

Concentration can be hindered by the production of excessive fines and overgrinding, which causes excessive sliming, must be avoided. This is best done by stage crushing and grinding. Present practice favours primary and secondary crushing in jaw crushers. Where tungsten minerals can be liberated at coarse sizes, the use of rolls following secondary crushing, produces less slimes than grinding equipment. When finer grinding is required than is ordinarily achieved by rolls, a rod mill should be used as the first grinding step since this produces less slimes than a ball mill. For still finer grinding, a grate-type ball mill is used. Sliming can be reduced in a ball mill by using an excess amount of water to carry the ore through quickly and to cut grinding contact time.

In achieving good recovery, classification is most important and the ore should be sized as it passes through the plant and as much tungsten mineral as possible recovered from each size material by using the equipment best suited to each stage. Sliming loss is thereby reduced by minimizing the quantity of tungsten minerals present in the material subjected to regrinding. The equipment necessary for treating slimes is also reduced. The best practice in good classification and separation of slimes from sands (granular products) is to place in the mill circuit such screens, hydraulic classifiers, settlers and cones as are consistent with economy, high recovery and the production of a marketable product.

Gravity Concentration

Gravity methods are commonly used to separate tungsten minerals from gangue material. Jigs are useful in concentrating tungsten ores in which the tungsten mineral occurs in a coarse form, permitting recovery of a coarse high-grade concentrate and reducing slime losses due to additional grinding. The feed is usually of crushed $\frac{1}{2}$ to $\frac{3}{4}$ in. ore and the $\frac{1}{2}$ to $\frac{1}{4}$ in. hutch product is usually a marketable concentrate. If not, it is upgraded in the fine jig or by tabling. If permissible, the coarse jig tailing is rejigged to produce a middling product and a final tailing for disposal, the pulsatory stroke being shortened to give a shorter and gentler lift in the jiggling compartment. Otherwise, all the coarse tailing is recrushed. In either instance, the jig middling or the coarse tailing is recrushed in rolls to ~ 10 mesh and the unclassified product jigged in the fine mineral jig, which recovers high-grade concentrate in all sizes (except slimes). The fine jig tailing is then ground and classified preparatory to table concentration.

Various types of shaking tables, such as Wilfley, Deister, Overstrom, Isbell, Card and James, which can be equipped with sand or slime decks, are used for concentrating tungsten ores.

The data in this article are extracted from U.S. Bureau of Mines Information Circular 7912, "Milling and Processing Tungsten", by J. B. Zadra. Though the survey is confined to the treatment of U.S. domestic deposits, much of the information is of general application.

When only coarse jigs are used, the ore and/or jig tailing or middling are ground to -10 mesh in a ball or rod mill, the product deslimed and the sand product classified into coarse, medium and fine, each fraction being concentrated separately on suitable tables to produce a concentrate, a middling and a tailing. The middling from the coarse tables and sometimes the coarse tailing are reground and classified for further concentration on the medium and fine sand tables. The same procedure is followed for the middling and tailing from the medium table. As much tungsten minerals as possible are recovered between each regrind and table treatment to avoid excessive losses of slime. The accumulated slimes are thickened and treated on a table with a slime deck or by flotation. Ample table capacity is required as recovery is lowered by overloading and standardization on one make of table gives flexibility in deck interchangeability and minimizes repair shutdowns.

Mechanical thickeners are used to thicken the pulp for further treatment and to recover as much water as possible for reuse. Other means of thickening are cones (for coarse products) and centriclones (for classifier overflow products and slimes). Drag classifiers are used for dewatering coarse products before drying.

Flotation

Concentration of non-sulphide tungsten minerals by flotation relies on the use of some derivative of the fatty acids. Contaminating sulphide minerals occurring with tungsten are first removed by flotation using a suitable reagent or aerofloat. The tailing from sulphide flotation is then treated with a gangue depressant and with oleic acid or tall oil as a collector for the tungsten minerals.

Since the tungsten content of most ores is low (0.4 to 1.0 per cent WO_3) a suitable lacy froth structure for high rejection of gangue material is obtained by using sulphonated hydrocarbon reagents of the detergent and wetting-agent type or certain rosin soaps. This must be used in small quantities, however, to avoid depressing the tungsten minerals. Flotation concentrates that contain 6 to 20 per cent WO_3 can be upgraded to 50 to 65 per cent WO_3 by tabling, with re-circulating of higher tungsten content tailings.

Chief among the flotation promoters or collectors of tungsten minerals are fatty acids, soaps and fatty acid emulsions. Oleic acid and sodium oleate are typical promoters. Oleic acid can also be used with Reagent 708, a fatty acid of vegetable origin. Emulsions of fatty acids stabilized with Aerosol OT or Aerosol 18 have possibilities for certain tungsten minerals. Promoters may, however, promote other undesirable minerals and reagent control is therefore important.

Most promoters are frothers to a certain degree and the use of some is limited because of excessive froth production. Alcohols, cresylic acid and Emulsol X-1 are used as frothers with fatty acids. Other frothers and froth modifiers are Aerosol 18, Aerosol 22, Aerosol OT, Reagent 801 and Reagent S-541. X-1 with oleic acid is more effective for scheelite flotation than the X-2 series. The Bureau of Mines information circular mentions a number of modifying and depressing reagents for varying conditions.

Various investigators consider that hydrogen-ion concentration is critical and that pulp alkalinity should be controlled within a pH spread of 8 to 10.5, depending on the ore and other factors.

Magnetic Separation

When pyrite and scheelite occur together they cannot effectively be separated by gravity because they have almost the same s.g. Pyrite can, however, be separated by a magnetizing roast at 600 deg. C. or less, followed by magnetic

separation. In the roast, coarse particles require longer to heat than fine particles and the ignition temperature of the pyrite must be maintained long enough for the adherent magnetic film to form. Rotary type furnaces can be used for small operations and rotary kilns or fluidized-bed reactors for large operations.

Induction roll and belt-type dry magnetic separators are in common use in beneficiating tungsten ores or concentrates. The material treated must be thoroughly dry and mechanically free and the desired product must have magnetic properties that differ from those of the constituents to be removed. Some ores respond to treatment when as fine as 280-mesh; others give trouble at 100-mesh.

Heavy-Medium Separation

With regard to the application of the heavy-medium separation process to tungsten ores, a heavy-medium pilot plant at Barking, England, uses galena as a suspension medium, while the Pan American Tungsten Co. use ferrosilicon at their Isle of Pines, Cuba, plant. The Hualpai Mining Co. at Yucca, Ariz., has been licensed to use the heavy-medium process for ore from the Boriana mine. The range of specific gravities among tungsten minerals, associated minerals and gangue material is quite large. The application of heavy-medium separation to amenable tungsten ores is considered worth while, though it does not lend itself to the concentration of scheelite.

Fundamental studies of flotation methods for treating tungsten ores were initiated by the U.S. Bureau of Mines in 1930 using ores containing scheelite, ferberite, wolframite, hübnerite and complex ores. The flotation concentrates, high in apatite and calcite, were leached with hydrochloric acid. The results of some of the tests are given in detail in the information circular. Although the tungsten ores used in the tests varied considerably in grade and, hence, the amount of reagents used varied with the ore tested, in every instance, good concentrates have been attained with satisfactory recovery of tungsten.

In the selective separation of tungsten minerals in a complex ore the order of increasing floatability is:— ferberite, wolframite, hübnerite and scheelite. Scheelite can be separated from wolframite, though this would not be advantageous on tungsten ores in which scheelite and wolframite were the only readily floatable minerals. If the ore contained other floatable minerals, such as fluorspar, a separation would be necessary to produce a marketable product, the fluorspar and scheelite being concentrated into one product and the wolframite into another. Re-treatment of the fluorspar-scheelite product would yield a fluorspar concentrate and a scheelite concentrate.

GROWING COAL DEMAND

IT is expected that demand for coal within the pool countries will rise by 3 per cent during this quarter—the first rise since the beginning of the coal glut in Europe some three years ago. It is anticipated that an increase in demand from the steel industry will more than offset the continuing drop in other markets.

Output of hard coal in the Community last year was 235,000,000 tons representing a drop of almost 12,500,000 tons as compared to 1958. West Germany, the principal producer in the Community, mined 7,000,000 tons less in 1959 than in the preceding year. Despite the anticipated slight overall increased demand for coal, a reduced working week will obtain in the coal mines. Even this measure will not materially affect the stocking problem and a record surplus of 33,000,000 tons is expected to be on the ground by the middle of the year.

RENEWED INTEREST IN CANADIAN GOLD

CONSIDERABLE more interest has recently been developing in Canada's gold industry and much of this new assessment is centering from new discoveries and the rather novel idea of gold profits being diverted to real estate propositions.

The gold stocks started taking on a new appearance at the turn of the New Year and the volume churned up by these stocks is doing much to accelerate overall activity on the Toronto Stock Exchange.

Perhaps the best performer, both stockwise and developmentwise, has been the associated team of Teck-Hughes Gold Mines Ltd. and Lamaque Mining Company Limited. Directed by Dr. Norman B. Keevil, who mesmerized Bay Street on a multimillion dollar play in 1959, the Teck-Lamaque team has come up with a brand new gold discovery in the prolific gold-producing Bourlamaque camp of northwestern Quebec, locale of such old-time producers as Sullivan Consolidated Mines, Manitou-Barvue Mines, East Sullivan Mines and the Lamaque. Now the latter company has electrified the area by a new strike about one mile distant from its main mining operation.

As Teck-Hughes Gold Mines, a long established gold producer of the Kirkland Lake camp in Ontario, owns over 81 per cent of the Lamaque, it was natural that both corporations' shares highlighted stock dealings on the Toronto exchange in mid-January.

Lamaque's initial drill hole, in the new occurrence underlying the tailings pond, averaged \$12.25 gold per ton across 97.6 ft. Included in the core was a 4.4 ft. section averaging \$88.76 per ton. Significance of the discovery is that the average grade for the camp runs from a low of \$4.40 per ton to a high of \$9.22 per ton average. The second hole, flattened in drilling to cut a portion of the original intersection, gave \$11.34 per ton over 42.8 ft.

Needless to say Lamaque is broadening its drilling programme and already neighbours are reassessing their properties in the hope of encountering similar new conditions.

The Bourlamaque camp, comparatively young in comparison to such old-time districts as Porcupine and Kirkland Lake, has yielded over \$350,000,000 in bullion and base metals to date. Since entering production in 1935 the Lamaque has contributed over \$90,000,000 of the total output. This is Keevil's first major discovery since his group acquired control of Teck and Lamaque in 1959.

Another property stirring up considerable interest these days is a block of 16 claims optioned by Vanguard Explorations Ltd. in the heart of the high-grade Yellowknife district in the North-west Territories. Scene is some 34 miles northeast of Giant Yellowknife Gold Mines Ltd. and 20 miles south and east of Consolidated Discovery Mines Ltd. (both producers).

Worked by an old-time prospector for the past 10 years, who recovered some \$40,000 from high-grading his single effort, the property has now been taken on by experienced mining interests who shared in such successful operations as Faraday Uranium Mines, East Sullivan Mines, Quebec Copper Corporation, etc.

The main showing, a 200 ft. length averaging 3 oz. gold plus, across a 3.5 ft. mining width to a depth of 26 ft., is to be thoroughly geologized, mapped and surface drilled to probe downward continuity of the occurrence. In all some 30 gold-bearing veins are reported present on surface.

The Yellowknife district is commonly regarded as Canada's highest grade gold camp and assays running into the ounces are fairly normal occurrences.

Another development drawing considerable interest these days is the diversification of gold profits from operations in the Noranda district, Que., to extensive real estate developments of Elder Mines & Developments Ltd.

Having accumulated important cash resources from its gold operations in the Noranda district the Elder management recently acquired outright control of Peel Village Developments Ltd., and through its subsidiary now owns about 1,000 acres of industrial, commercial and residential land at Brampton, Ont., about 19 miles north-west of Toronto. Elder, through its underlying interest, has already taken steps to erect and lease a large modern shopping centre which will supply the needs of an area populated by some 45,000 persons; to sell lots for residential purposes and to invite top-flight industrial concerns to open plants in the development.

Needless to say the drilling undertakings of Lamaque and Vanguard are doing much to stimulate interest in their respective districts where deals have already been consummated and where new "risk" capital has already been raised through primary distribution of stock on the Toronto exchange.

In Bourlamaque, the ground lying south of the Lamaque has already changed hands for an apparently aggressive new exploration undertaking. The ground held by Aumaque Gold Mines, between Lamaque and the producing East Sullivan Mine, is to be reactivated on funds secured through a current underwriting on stock. Rumours are current that the Rocdor, on the west end of the Lamaque, will also resume work. It is also possible that other claim holders in the district will reassess possibilities.

A similar situation is also developing up in the Yellowknife district where the disposition of the prospector-owned high-grade showing to Vanguard, has excited the imagination of other companies desirous of duplicating results. Heavily staked in the past summer surrounding ground to the Vanguard is now falling into new hands. Paramaque Mines and Bibis Yukon Mines together with the Norman Vincent interests have acquired claims for the express purpose of commencing active explorational programmes.

By CLAUDE H. TAYLOR

This revival of gold, of course, can also be duplicated at many additional known gold camps spread throughout the Dominion. The Red Lake district of Ontario has been undergoing a marked revival and underground shaft sinking jobs are well advanced at such promising prospects as H. G. Young Mines, Martin-McNeely Mines, Abino Gold Mines and others.

Canada's mining guesstimators are now wondering if the new interest in gold spells a revival of the famed discoveries of the "thirties" when gold kept the mining industry alive despite the depressed conditions that prevailed following the stock market collapse of 1929. It is certainly apparent that a great many more corporations and prospectors will be looking for gold this year than at any time since the rather "fabulous forties" of Yellowknife fame. Since their product is readily exportable, or readily saleable to the Ottawa mint, the gold producers are not confronted with the multiplicity of marketing problems faced, from time to time, by the producers of base metals. They merely suffer from the high cost of doing business these days and receive less than the \$35 per ounce mint price, due to payment in United States funds. However, there are certain benefits, such as the subsidy paid the high-cost producers under terms of the Emergency Gold Mining Assistance Act.

WEST GERMANY'S MINERAL INDUSTRIES IN 1959

AS seen at the start of this year, the Federal German minerals industry shows a picture of satisfactory development after a sticky period for manufactured minerals and a fall in production for raw materials. Production over the past year climbed in the field of both ferrous and non-ferrous manufactures and semi-manufactures and at the turn of the year both full order books and recent heavy investments spoke for a bright future.

Hard Coal the Principal Mineral

The country's main mined mineral—hard coal—suffered under the coal market crisis which has been affecting all Western Europe since early 1958. Despite a continued rise in man-shift productivity which brought individual averages up almost to the 2-tonne mark, national output fell by as much as 7,000,000 tonnes over the year for 1958 levels (exact figure 6,995,000 tonnes) to a total of 125,590,000 tonnes (excluding Saar production, which stood for the year at 16,100,000 tonnes, only 100,000 tonnes below 1958 levels). West German coke output fell from 39,580,000 tonnes to 34,725,000 tonnes over the year, and that of hard coal briquettes from 5,630,000 tonnes to 4,710,000 tonnes. A total of 17,000,000 tonnes of coal and coke were in unsold stock at the end of the year, while stocks on the Saar rose to a total of 1,900,000 tonnes. Future production is to be so controlled as to suit the saleable annual total of between 105,000,000 tonnes and 110,000,000 tonnes, and a programme of partial and full pit closures is being carried out to enable this further cut in output of from 5,000,000 to 10,000,000 tonnes a year. Some 12 to 15 pits are to be closed as a result. Already, some 44 of the 114 pits of the Ruhr area have laid compensation claims before the Government regarding partial or full pit closure. Over 1959 alone, full closures affected concerned the annual production of over 4,000,000 tonnes of hard coal, 3,260,000 tonnes of coke and 400,000 tonnes of hard coal briquettes.

Brown coal output in West Germany, on the other hand, hardly altered over the year, a 1959 output of 93,470,000 tonnes comparing with one for the previous year of 93,490,000 tonnes of crude brown coal.

The Iron Industry

Slight falls in production or virtual stagnation were to be seen in most other crude minerals produced in Germany. Iron ore output fell off further, despite the efforts made by the industry during the year to enlist the protection of the country's Government and to persuade German iron and steel producers to use more native material, which owing to bad mining conditions cannot compete in price with foreign imports. In the first ten months of the year output was down by only 0.8 per cent on the previous year's levels, but the future seems to hold no prospect of any improvement in sales. Down in production by the same degree were raw potassium salts, the market for which is now in a state of stagnation. Producers formed into a cartel in the hope of more effective marketing and this cartel was given the blessing of the country's Federal Cartel Office. Metal ore mining production over 1959 produced a total for all metals of DM 55,000,000 (about £4,600,000), as against a value of products for the previous year of DM 62,000,000, or almost £5,250,000. However, production of lead and zinc ore started to show

rising tendencies towards the end of 1959 owing to an improvement in world demand. Producers controlled their output fairly strictly over the year in order to set up some measure of price stability.

In the field of manufactured and semi-manufactured mineral products, the ferrous industry stood at the head of the list with a new record output. In 1959 over 26,000,000 tonnes of raw steel was produced in West Germany, as compared with only 22,800,000 tonnes in the previous recession-affected year and 24,500,000 tonnes in the previous record year of 1957. Adding the steel output of the now reunited Saar to this total, German production for 1959 was well over 29,000,000 tonnes. The intention of producers to revert to a very high level of investment as from the middle of the current year shows their hopes for the future. To a certain extent, this return to full health of the steel industry will stop the native coal industry from falling into any really disastrous position. Also affected is the sinter dolomite industry of the country, annual production of which has now reached some 700,000 tonnes per year.

The Base Metals

Monthly production of refined lead in the country had reached the highest level since the war by the latter months of 1959 at almost 16,500 tonnes after a low level of production in earlier months. Processing installations closed at Mecherich caused a fall in output which was, however, compensated for by the bringing into operation of improved plant at Nordenham. Production of re-smelted lead is stagnating due to a lack of old lead, and the share of lead concentrates produced from indigenous raw materials was falling towards the end of last year. Mined output of lead in West Germany fell during 1959, monthly average output being only about 5,000 tonnes lead content.

Monthly average production of zinc ore was at a level of some 7,500 tonnes zinc content towards the end of 1959. Production of refined zinc, which seems to have reached the monthly average of some 15,500 tonnes (raw), rose over the year as a result of better market conditions; fine zinc production also rose satisfactorily.

By October, 1959, monthly primary copper output had reached 18,300 tonnes and that of refined copper about 6,000 tonnes. Copper content of mined material is progressing well and is expected to have reached 150 tonnes per month by the end of the year.

After a depressing start to the year, unalloyed refined aluminium output is moving up again, having passed the 14,000-tonne mark before the end of 1959; at the start of the year monthly production was no more than 9,500 tonnes. Resmelting production is also improving and was approaching the 9,000-tonne level.

Refined tin, tin alloy and solder tin output remains steady, the latter showing rising tendencies.

Precious metal estimates for 1959, as compared with 1958 figures, are 340 (278.1) tonnes of silver, 1,200 (1,252) kilogrammes of gold, 30 (25) kilogrammes of platinum and 30 (37) kilogrammes of palladium.

Estimated West German exports for 1959 include 75,000 (64,209) tonnes of refined copper, 28,000 (26,419) tonnes of refined lead, 17,000 (20,988) tonnes of zinc and 1,200 (3,705) tonnes of aluminium.

MINING MISCELLANY

It is expected that iron ore production in Sierra Leone will be increased by 500,000 tons to 2,000,000 tons during the course of the next year. Construction work on a new concentrating plant at the Sierra Leone Development Co.'s Marampa location is to begin in May and is scheduled to be completed in late 1960. Last year, shipments from Marampa totalled 1,600,000 tons, a record. The company is to open a new opencast mining area at Tonkolili in the Northern Province. It is hoped that production from the two locations will eventually reach some 6,000,000 tons a year.

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Statistics issued from Moscow this week show that during 1959 the Soviet Union produced, among other industrial items and materials, some 94,400,000 tonnes of iron ore, 506,500,000 tonnes of coal, 53,400,000 tonnes of coke, 43,000,000 tonnes of pig iron, 59,900,000 tonnes of raw steel, 47,700,000 tonnes of rolled ferrous goods, 129,500,000 tonnes of mineral oil, 37,200,000,000 cu. m. of natural gas, 38,800,000 tonnes of cement and 264,000,000,000 kWh. of electrical energy. Coal output rose by the smallest degree—2 per cent—while that of raw steel went up by 13 per cent, that of mineral oil by 14 per cent and that of natural gas by 25 per cent.

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British Newfoundland Corporation Ltd. (BRINCO) is to build a 120,000 h.p. hydro-electric plant near Hamilton Falls, Labrador. Work is to begin this month, according to a statement issued in Montreal by the company. The project, including transmission lines, was scheduled for completion by the summer of 1962. The Iron Ore Co. of Canada and the Wabush Iron Co. have agreed to buy power for use in the new iron mines in the Wabush Lake area in Labrador, 110 miles from the projected power site. The construction site will be at Twin Falls on Unknown River, 12 miles to the southwest of Hamilton Falls, which has an estimated potential 300,000 h.p. The company has said that negotiations for the sale of Hamilton Falls power continue. The potential there is 4,000,000 h.p. at one site. Brinco's subsidiary, Hamilton Falls Power Corp. (of which 20 per cent is owned by Shawinigan Engineering Co.) is to set up a subsidiary to undertake the development of the Twin Falls site.

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Iron ore from the Indian colony Goa is the main item of an exchange deal by which Portugal will receive some 50,000 tonnes of crude oil from the Soviet Union.

After suffering a drop of four consecutive years, prospecting activity in Ontario showed an upward trend in 1959 when 26,031 mining claims were recorded throughout the province. Figures released by the Ontario Department of Mines show this to be an increase of more than 2,000 over the 23,980 registered in 1958.

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Malaya's permanent representative on the International Tin Council, Sir Vincent Tufo, arrived in Kuala Lumpur on February 1 to spend three weeks in the country. He is expected to discuss a proposed new draft of the International Tin Agreement with leaders of the industry there. This draft agreement will be discussed at a United Nations conference in May next. A government statement has said that the object of Sir Vincent's visit was to "acquaint the people on the ground" with his work in the International Tin Council. He is to visit Ipoh—centre of the Malayan tin industry—and to meet members of both the Federation of Malaya Chamber of Mines and the All-Malaya Chinese Mining Association.

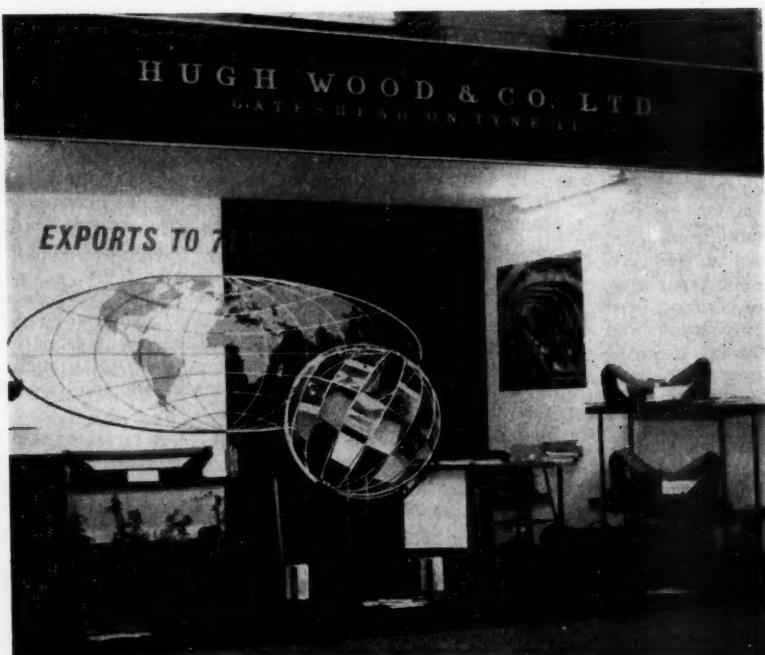
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The arrival in the U.K. last week of two engineers of the Egyptian Sinai Manganese Co. is evidence of the gradual return to Anglo-Egyptian commercial normalcy. The visit itself and the views expressed by the visitors, Mr. Ahmed Murad Kheirallah, assistant general manager of the Sinai Manganese Co., and Mr. Fawzi Aziz Helmy, chief mechanical engineer, confirm also that in the purchase of capital goods Egypt looks naturally to Britain for quality and reliability. The Sinai Manganese Co. plans this year to step up its production to 200,000 tons of run-of-the-mine manganese ore. A re-equipment programme to bring this about has resulted in the placing of orders with British companies for mining plant, transportation equipment, and spare parts. First of the orders to be placed is for three Holman Rotair compressors. Fergusson, Wild and Co. Ltd., market and shipping agents for the Egyptian company are advising on the production step-up at Sinai.

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An order for what is believed to be the largest converter fed winders in the world has been received by English Electric from Goldfields of South Africa Ltd. The two winders, each of 6,000 h.p., will be installed at the West Driefontein and Doornfontein mines. These winders are also believed to be the first to operate on a very high voltage system. The winder converter transformers will be directly connected to the 40 kV. grid, which has a prospective fault capacity of 1,000 MVA. The double drum winders, mounted on the surface, will have balanced skips with a payload of 10 s.tons and an output of 277 tons per hr. from a depth of 6,000 ft. when winding at a rope speed of 3,600 ft. per min. Each drum will be 16 ft. dia. and 6 ft. wide. The winding rope will be 2 in. dia.

The War on Want Exhibition held at the Central Hall, Westminster, closed on January 23. The Exhibition was sponsored by the War on Want Trust, its object being to draw attention to the need for raising living standards throughout the world. Only a limited number of firms, each individually representative of a different branch of industry, were invited to take part. Hugh Wood and Co. Ltd. were thus honoured and at their stand, seen here, a comprehensive brochure on conveyors and an informative booklet covering the complete range of equipment developed by the company for use in the mining industry, were available to the public



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Tenders for the drilling of not less than 10,000 ft. of boreholes in the Leinster coalfields area in Eire have been invited by the Department of Industry and Commerce. The Eire Geological Survey Office has been working on a survey of these coalfields under the Technical Assistance Programme, and drilling has been undertaken at selected sites near existing coal mines.

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The latest company to start an iron ore mine in the Ipoh area of Perak is the Perak Iron Mining Co. This company expects to commence mining operations very soon about six miles south of Ipoh, where it has acquired a deposit estimated to contain 4,000,000 tons of high grade ore. The mined ore will be stockpiled in readiness for shipment to Japan when its ship-loading installations are completed about the end of March. The company has started work on the construction of giant ore bins at Damar Laut, about three miles from the mouth of the Dindings River. The next phase will be the building of a 1,800 ft. long ramp, extending into midstream, to take a conveyor belt which will carry ore from the bins direct into the holds of ocean freighters. The estimated cost of this project is \$M.1,500,000. Ore will be transported in lorries from the mine to Damar Laut, a distance of 66 miles compared with 110 miles to Prai, which is the port for shipment used by the present mines operating near Ipoh. At Prai ore is loaded into lighters which carry it to freighters lying in the roads, an expensive process.

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Gold production in Sarawak in 1959 was 2,400 oz., nearly three times the production in 1958. The number of mines working around Bau, 25 miles south-west of Kuching, was nine, an increase of four compared with 1957. The Government of Sarawak has recognized the difficulties with which the miners working the isolated, scattered and generally small but relatively rich deposits have had to contend since the Second World War. Although the government has never been able to subsidize the industry, it has in recent years waived the right to royalty on production. The biggest help received by the industry and which has contributed largely to the output expansion, is the permission granted late in 1958 to the miners to sell their gold on the free market. Consequently they can now get around \$M.122 an oz. locally, in Kuching, compared with \$M.102 previously obtained in Singapore. Dr. F. W. Roe, the Director of Geological Survey, British Territories in Borneo, commenting on the increased gold production said on January 25, that it was clear that given a reasonable price a useful gold output could still be obtained from the Bau deposits, but he doubted if the industry could recover its former importance.

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Mr. Joseph Smallwood, Premier of Newfoundland, announced in St. John's recently that construction of a mine to work 2,000,000 proved tons of copper deposits at Little Bay, on the north-east coast, would begin when weather conditions allowed. The Newfoundland Government had agreed to guarantee a \$2,000,000 bond issue by the Atlantic Coast Copper Company to put the mine into production.



The highlight of the Engineering Materials and Design Exhibition, opening at Earl's Court on February 22, will be a collection of more than fifty outstanding castings selected from companies throughout Britain by the British Steel Founders' Association, Sheffield. The British steel foundry industry hopes that this collection will show that there are now considerable facilities in this country for the economic production of components of all types for a wide variety of industrial purposes. The examples which will be on display, either by actual castings or photographs, range from golf club heads to the hydraulic cylinder for a 105,000 ton tanker. Of particular interest is the fact that automatic coupling for mine cars is making obsolete the use of chains and hooks, giving improved operation and greater safety. The couplers and draftgear shown herewith are made by English Steel Castings Corporation Ltd.

Coming Events

The Society of Chemical Industry's Surface Activity Group is holding a Symposium on September 29 and 30, 1960, at the Royal Institution, London, in the subject of "Powders in Industry: Properties and Principles of Application". Among papers which will be presented at this Symposium are the following: "Mechanical Production of Fine Milling", by W. H. Bickle, D.S.I.R.; "Recovery and Processing of Natural Powders", by Dr. N. O. Clark, English Clay Lovering Pochin and Co.; "Soil Mechanics", by Prof. S. V. Nernst, Institute of Water Transport Engineers, Leningrad; "Coal", by C. C. Dell, University of Leeds; "Mineral Dressing", by Prof. P. G. Kihlstedt, Royal Institute of Technology, Stockholm; "Explosives", by Dr. S. Fordham, Imperial Chemical Industries Ltd., Nobel Division, Dr. M. G. Fleming, of The Bessemer Laboratory, Imperial College of Science and Technology, London, is chairman of the Organizing Committee of the Symposium.

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The Royal Society of Arts announce that Three Cantor Lectures on "The Fuel and Power Industries and National Prosperity" will be delivered by Dr. Albert Parker, C.B.E., on February 15, 22 and 29, at 6 p.m. The titles of these lectures are: I, "World and National Energy Resources"; II, "Production and Treatment of Coals and Oils"; and III, "Natural and Manufactured Gas".

★

The Leipzig Spring Fair will take place in East Germany from February 28 to March 8, 1960, and will include a Technical Fair, showing capital equipment of every industry.

An exhibition of industrial diamonds is to be held by the City Science Museum, Birmingham, from February 16 to March 16, 1960, inclusive, the organizers being the Industrial Diamond Information Bureau. It will take place in the City Science Museum Building. Concurrently there will be an exhibition of gem diamonds in the Art Gallery, Birmingham, the technical consultants being De Beers Consolidated Mines Ltd. A number of lectures have been arranged in conjunction with these events, including one by Dr. T. F. Gaskell on "Deep Hole Diamond Drilling" and one by Prof. S. Talansky on "The Physical Properties of Diamond".

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The Compressed Air and Hydraulics Exhibition and Conference will be held at the Empire Hall, Olympia, from April 25-29, 1960.

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The joint annual meetings of the Chemical Society and the Royal Institute of Chemistry will be held in Belfast, Northern Ireland, from April 5-8, 1960. Applications from those wishing to attend should be made before the end of February, and requests for reservations not later than February 15.

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The Mechanical Handling Exhibition for 1960 will be held in Earls Court, London, from May 3 to 13. This is the world's largest exhibition of labour-saving equipment, organized by the Iliffe journal *Mechanical Handling*. It will be open from 10 a.m. to 6 p.m., each day, with the exception of Sunday, May 8.

Metals and Minerals

Volta Over the Last Hurdle?

The opening of a new chapter in the long history of the Volta Scheme is indicated by a cable from New York to the effect that The Kaiser Aluminium and Chemical Corporation heads a "Consortium of Aluminium Producers" planning to construct an aluminium reduction plant in Ghana. The consortium is to be known as the Volta Aluminium Corporation or VALCO and according to present plans Kaiser Aluminium will operate the facility. The company's president, Mr. D. A. Rhoades, stated that all primary aluminium produced in Ghana by VALCO would be sold only to consortium members in proportion to their participation in the enterprise.

The Volta River Project for hydroelectric development and aluminium production has a long and chequered history. Earlier investigations led to discussions in 1952 between the British and Gold Coast Governments and two companies, Aluminium Ltd. of Canada, and the British Aluminium Co. It was then agreed that the two governments would jointly set up a Preparatory Commission to examine the scheme comprehensively. The Commission's report appeared in 1956. Whereas the White Paper of 1952 estimated that the project would cost approximately £100,000,000 at the initial stage (to produce 80,000 tons of aluminium a year) and £144,000,000 by the

final stage (210,000 tons), the Commission placed the cost at about £160,000,000 at the initial stage and £230,000,000 at the final stage, based on prices ruling at September 30, 1955. Publication of the report came at a time when world aluminium production had temporarily overtaken demand, rival projects had been embarked upon in other territories, and enthusiasm for the project had waned.

On March 7, 1957, Ghana achieved independence and Dr. Nkrumah, who from the first had been keenly interested in the Volta River scheme, made determined efforts to secure the implementation of this cherished project. On his visit to America in 1958 he apparently obtained a promise of support from President Eisenhower, provided American advisers reported favourably on the project. The Kaiser Corporation of California was accordingly asked to make a reassessment of the engineering aspects. In view of the encouraging nature of the corporation's report, which indicated that more power could be generated from the Volta, and also more cheaply, than was first thought, Dr. Nkrumah asked Mr. Edgar Kaiser, president of Kaiser Industries, to take the initiative in forming a consortium of aluminium companies to build an aluminium smelter at Tema.

Though no further details are at present available, Kaiser's announcement of VALCO's formation suggests that the last hurdle has been overcome. In the words of Mr. Rhoades, the proposed facility can be expected to become a "cornerstone in the basic economy of the country". Apart from its economic significance, the fact that the project on which Dr. Nkrumah has set his heart is to be carried out with Western capital and technical resources should further strengthen the friendly relations existing between Ghana and the West.

Vereinigte Aluminiumwerke AG, West Germany's largest producer of aluminium, may soon be able to increase its production substantially and to increase its ability to compete internationally. This was stated in an announcement by Rheinisch-Westfälische Elektrizitätswerke AG, which said that negotiations between the two companies were in progress. The electricity company is to build a second 150 mW. block for the aluminium company much sooner than within the ten years originally planned. This would increase the aluminium production capacity of Vereinigte Aluminiumwerke by a further 60,000 tons annually from its present capacity of 170,000 tons a year.

The danger that U.S. stockpiling of Jamaican bauxite was about to end took Mr. Norman Stanley, the Jamaican Premier, to Washington last month. There he discussed with State Department officials the future of the bauxite stockpiling programme, which at present brings the Jamaican Government well over \$3,000,000 a year. During the four years 1956-59, over 4,000,000 tons of Jamaican bauxite have gone to the U.S. under this programme. The purpose of the Premier's visit was to seek a continuance of the programme, and to explain why bauxite revenues were vital to Jamaica's development programme. On his return to Kingston Mr. Stanley said that he had been able to secure a most sympathetic hearing of the island's case.

LONDON METAL AND ORE PRICES, FEB. 4, 1960

METAL PRICES

| | |
|---|--------------------------------|
| Aluminium, 99.5% | £186 per ton |
| Antimony— | |
| English (99%) delivered, 10 cwt. and over | £190 per ton |
| Bismuth (min. 1 ton lots) | 16s. lb. nom. |
| Cadmium 10s. 0d. lb. | |
| Cerium (99% net) | £16 0s. 1d. lb. delivered U.K. |
| Chromium, Cr. 99% 6s. 1d./7s. 4d. lb. | |
| Cobalt, 14s. lb. | |
| Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram | |
| Gold, 250s. 5d. | |
| Iridium, £23/£25 oz. nom. | |
| Lanthanum (98%/99%) 15s. per gram. | |

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|---|--------------|
| Manganese Metal (96%/98%) | £245/£250 |
| Magnesium, 2s. 2d./3s. 3d. lb. | |
| Nickel, 99.5% (home trade) | £600 per ton |
| Osmium, £21/£23 oz. nom. | |
| Osmiridium, nom. | |
| Palladium, imported, £9 | |
| Platinum U.K. and Empire Refined | £30 5s. |
| Imported £28/£29 | |
| Quicksilver, £7½ ex-warehouse | |
| Rhodium, £50 oz. | |
| Ruthenium, £18/£20 oz. nom. | |
| Selenium, 50s. 0d. per lb. | |
| Silver, 79d. f. oz. spot and 79½ d. f'd | |
| Tellurium, 21s. 6d. lb. | |

ORES AND OXIDES

| | | |
|---|--|---|
| Antimony Ore (60%) basis | | 19s. 6d./21s. 6d. per unit, c.i.f. |
| Beryl (min. 10 per cent BeO) | | 230s. per l. ton unit BeO |
| Bismuth | | 65% 6s. 6d. lb. c.i.f. |
| Chrome Ore— | | 18/20% 1s. 3d. lb. c.i.f. |
| Rhodesian Metallurgical (semifriable) 48% (Ratio 3 : 1) | | £15 15s. 0d. per ton c.i.f. |
| " Hard Lumpy 45% (Ratio 3 : 1) | | £15 0s. 0d. per ton c.i.f. |
| " Refractory 40% (Ratio 3 : 1) | | £11 0s. 0d. per ton c.i.f. |
| " Smalls 44% (Ratio 3 : 1) | | £14 0s. 0d. per ton c.i.f. |
| Baluchistan 48% (Ratio 3 : 1) | | £11 15s. 0d. per ton f.o.b. |
| Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1) | Nb ₂ O ₅ :Ta ₂ O ₅ | 175s. per l. ton unit c.i.f. |
| Fluorspar— | | |
| Acid Grade, Flotated Material | | £22 13s. 3d. per ton ex. works |
| Metallurgical (75/80% CaF ₂) | | 156s. 0d. ex. works |
| Lithium Ore— | | |
| Petalite min. 34% Li ₂ O | | 40s. 0d./45s. 0d. per unit f.o.b. Beira |
| Lepidolite min. 33% Li ₂ O | | 40s. 0d./45s. 0d. per unit f.o.b. Beira |
| Amblygonite basis 7% Li ₂ O | | £25 0s. per ton f.o.b. Beira |
| Magnesite, ground calcined | | £28 0s./£30 0s. d/d |
| Magnesite Raw (ground) | | £21 0s./£23 0s. d/d |
| Manganese Ore Indian— | | |
| Europe (46%-47% basis 6/s. 6d. freight) | | 73d./75d. c.i.f. nom. |
| Manganese Ore (43%-45%) | | 69d./71d. c.i.f. nom. |
| Manganese Ore (38%-40%) | | nom. |
| Molybdenum (85%) basis | | 8s. 11d. per lb. (f.o.b.) |
| Titanium Ore— | | |
| Rutile 95/97% TiO ₂ (prompt delivery) | | £29 per ton c.i.f. Aust'n. |
| Ilmenite 52/54% TiO ₂ | | £11 10s. per ton c.i.f. Malayan |
| Wolfram and Scheelite (65%) | | 155s. 0d./160s. 0d. per unit c.i.f. |
| Vanadium— | | |
| Fused oxide 95% V ₂ O ₅ | | 8s./8s. 11d. per lb. V ₂ O ₅ c.i.f. |
| Zircon Sand (Australian) 65-66% ZrO ₂ | | £16/£16 10s. ton c.i.f. |

NICKEL'S EXPANDING USES

In his year-end review of the nickel industry, referred to in our last week's issue, Dr. John F. Thompson, chairman of International Nickel, gave the following estimate of Free World nickel consumption during 1959 by fields: (in per cents)—stainless steels 29, high-nickel alloys 16, electroplating 15, nickel alloy steels 15, foundry products 12, copper-nickel alloys 4, others 9.

The statement pointed out that the pattern of nickel use by the various industries throughout the Free World during the latter part of the year had been profoundly influenced by the steel strike in the U.S.

As can be seen from the figures, stainless steels were by far the largest consumer of nickel. During the year their use was expanded in the rocket and missile field. For example, each missile launching pad installation requires almost 100 tons of nickel stainless steel. Advances were made in the architectural field, which is recognized as being one of the great potential markets for stainless steels. In the automotive field, stainless steels have shown an advance economically as well as technologically for a larger amount of the bright work

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on passenger cars. Another development is the interest in smog-controlling devices which, it is anticipated, will be constructed of stainless steel.

Production of high-nickel alloys continued to consume substantial quantities of nickel during 1959 and an increasing number of manufacturers undertook production of these materials. There is a continuing development in engines of all types towards the use of alloys capable of withstanding higher and higher temperatures. Age-hardenable nickel-base alloys have been developed recently which permit the higher turbine blade temperatures necessary for greater efficiency in gas-turbines and jet engines. This necessitates the use of alloys with greater nickel contents in various other components to obtain the required strength without increasing weight. The transition from piston engines to jet and prop-jet power for faster commercial aircraft provides a market for high-nickel alloys that should continue to increase.

REVISED BARTER LIST

The Agricultural Department at Washington has announced a revised list of foreign-produced strategic materials which could be considered for the barter of U.S. surplus commodities. Materials acquired through barter are added to the supplemental stockpile, which is entirely separate from the national stockpile of strategic materials. It is regarded as a reserve stock of materials.

Materials which currently might be acquired for the supplemental stockpile through barter are as follows: Aluminium oxide abrasives, both fused and crude; amosite asbestos, blue crocidolite asbestos, grade S only; two grades of bauxite, Surinam and refractory; beryl, but hand-cobbled only; bismuth; cadmium; two grades of chromite, chemical and refractory; acid grade fluorspar; three grades of manganese, chemical grades A and B and metallurgical grade; silicon carbide; tin; antimony.

COPPER • TIN • LEAD • ZINC

(From Our London Metal Exchange Correspondent)

The general picture of metal prices has undergone a sharp change during the last week as all prices with the exception of that of tin have declined sharply for a number of reasons, but the fall has undoubtedly been assisted by some liquidation of long positions and in some cases the creation of short positions.

COPPER PRICES REFLECT U.S. STRIKE SETTLEMENTS

The copper market opened the period under review with the news that the Kennecott strike had been completely settled and that operations would recommence as soon as possible. This news more than offset the information that at the Garfield Smelter the plant had been closed for lack of raw material and that it would probably be some six weeks before full output was reached again. Later in the period there was a break through in the negotiations between the Mine Mill Union and Phelps Dodge when agreement was reached on the inclusion of a "no strike" clause in any new agreement, and observers feel that a settlement will be reached without much further delay. The position with Anaconda is still unchanged, but here it seems likely that this company will not remain the only one not fully working for any considerable period.

Demand for copper remains good in the U.S. but fancy prices are no longer being paid, although at least one buyer had to pay 39 c. for immediate delivery copper last week. March copper, however, is available in limited quantities from customs smelters at 35 c. per lb. and although dealers have reduced their price to the region of 37 c. per lb. it appears that business is almost non-existent at this level. Offerings of scrap became very plentiful and the smelters' intake price has been reduced by up to 1 c. per lb. to 25½ c. per lb. for No. 2 scrap, which seems to indicate that lower prices

for refined metal may prevail during the second quarter of the year.

In London the market itself has been active with a fairly sharp downward tendency being noticeable which was only halted momentarily by a further fall in stocks in official warehouses of 625 tons to a total of 4,372 tons. After a peak backwardation on January 28 the fall in the price level immediately reduced the size of the backwardation; although short periods of technical scarcity are likely to occur throughout February, it seems probable that the backwardation will now commence to diminish although its complete elimination cannot be foreseen. There has been continued consumer demand in the U.K. and in Western Europe, and in addition some Eastern European countries have been buying and further import licences have been granted to Japanese importers.

TIN IN GOOD DEMAND

The tin market has continued its even way but with a slight contraction in the backwardation. Stocks in official warehouses decreased slightly to 8,633 tons. Demand continues reasonable and the offtake in Singapore continues to be well up to the average of the past few weeks; that is, well in excess of 200 tons per market day. It is interesting to note in this respect that the January figures of shipments show 5½ tons from Singapore and 4,924 tons from Penang as against 8½ tons and 3,763 tons respectively for December: of the Penang shipments about 190 tons were shipped to the U.K., which is considerably higher than the small tonnages which have been coming in the last few months. The U.S. shipments remained fairly steady at 2,417 tons, whilst the next largest buyer was Japan with 1,040 tons.

On Thursday the Eastern price was equivalent to £796½ per ton c.i.f. Europe.

FINDINGS OF THE LEAD-ZINC STUDY GROUP

The communiqué covering the Lead-Zinc Conference in Geneva became available on the morning of Thursday 4th, but up till then sentiment had weakened on reports that the conclusions of the Study Group would be that the producers would be justified in raising all restrictions on the availability of zinc, but that they should retain some measure of curtailment in supplies of lead. It was felt that the producers would act on these findings and that the additional tonnage of zinc made available would be sufficient to cause a lower price level to become established, whilst in the case of lead the suggestion that restrictions should be retained indicated that there was still a considerable over-supply of lead metal in sight.

The actual findings of the Study Group, however, may impart firmness to the zinc market, since, although the recommendation is that all restrictions on availability should be lifted, it goes on to point out that there appears to be the possibility of an excess of consumption over current production of some 75,000 tonnes. The size of this figure is rendered less formidable to some extent by a note that producers' stocks of prime western zinc in the U.S. are substantially above normal working levels. The communiqué also announced that the U.K. Government intends to dispose of the remainder of its zinc stockpile amounting to some 54,000 tonnes most of which consisted of high-grade and special high-grade zinc, but its impact on the market will be very small as deliveries would be spread over up to four years.

Turning to lead, the picture given by the communiqué is less satisfactory, since it is estimated that during 1960 there will be excess production over consumption of about 100,000 tonnes. In view of this there is a recommendation that producers should continue to limit the tonnage put on the market, and it appears that producers are prepared to do this to an extent whereby the excess is reduced to an annual rate of 50,000 tonnes and that restrictions will remain in force for the next nine months; it is pointed out that this rate of excess availability is equivalent to only about 2½ per cent of the rate of consumption forecast. The communiqué also announced that in the case of lead the U.K.'s remaining stockpile amounted to some 14,000 tonnes but that no immediate disposal was envisaged except for the negligible tonnage of 800 tonnes which would be disposed of shortly to release storage premises.

Closing prices are as follows:

| | Jan. 28 | | Feb. 4 | |
|-----------------|-------------|---------|-------------|---------|
| | Buyers | Sellers | Buyers | Sellers |
| COPPER | | | | |
| Cash .. | £272 | £273 | £263½ | £264 |
| Three months .. | £254½ | £255 | £244½ | £245 |
| Settlement .. | £273 | | £264 | |
| Week's turnover | 13,800 tons | | 10,875 tons | |
| LEAD | | | | |
| Current ½ month | £75 | £75½ | £73½ | £73½ |
| Three months .. | £75½ | £75½ | £73½ | £74 |
| Settlement .. | | | £73½ | |
| Week's turnover | 9,150 tons | | 6,275 tons | |
| TIN | | | | |
| Cash .. | £794 | £794½ | £792 | £793 |
| Three months .. | £788 | £788½ | £788½ | £789 |
| Settlement .. | £794½ | | £793 | |
| Week's turnover | 660 tons | | 595 tons | |
| ZINC | | | | |
| Current ½ month | £93½ | £94 | £89½ | £89½ |
| Three months .. | £92½ | £92½ | £89½ | £89½ |
| Week's turnover | 5,900 tons | | 6,575 tons | |

Mining Finance

Higher Anglo Group Dividends

Four Anglo American Corporation investment companies have issued their preliminary profit announcements for 1959. The details, including the final dividends, are given in the accompanying table. There was some initial market disappointment with the West Rand Investment Trust and Orange Free State Investment Trust announcements, the former mainly because the dividend was unchanged and for both companies because the profits were down, not up. The Ofcits dividend of 4s. 9d. compares with 4s. for 1958.

| | <i>Dividends</i> | <i>1959</i> | <i>1958</i> | <i>Int.</i> | <i>Final</i> | <i>Profit</i> | <i>Profit</i> |
|-------------------|------------------|--------------|---------------|---------------|---------------|---------------|---------------|
| | <i>s. d.</i> | <i>s. d.</i> | <i>£000's</i> | <i>£000's</i> | <i>£000's</i> | <i>£000's</i> | <i>£000's</i> |
| Anglo Am. Inv. | 7 6 | 15 0 | 3,408 | 2,829 | | | |
| O.F.S. Inv. Trust | 2 0 | 2 9 | 2,649 | 2,683 | | | |
| Vereeniging Est. | 3 0 | 5 0 | 1,195 | 1,139 | | | |
| W. Rand Inv. | 1 3 | 2 3 | 2,251 | 2,633 | | | |

The explanation of the profits decline is that neither concern is likely to have anywhere near repeated the exceptionally high "surplus on realization of investments" achieved in 1958 when both trusts took part in the block share sale deals made by Anglo American with the new U.S. Kaffir trust, American-South African Investment. This brought in £455,371 to Writs and accounted for the bulk of Ofcits revenue of £502,385 under this heading. Moreover, the profits on the A.S.A.I. deals, by special arrangement with the authorities, were allowed to be tax free.

The absence of any increase in the Writs dividend is due to the Board's decision once again to augment the company's general reserve. In 1958 the exceptionally high allocation of £800,000 was made, it being decided, wisely enough, to put by the special A.S.A.I. profit. For 1959 another £400,000 is added to this fund. Writs has,

of course, to bear in mind that its stake in the embryo mines, Zandpan and Western Deep, will require the provision of more money in due course.

ANGLO TRUST PAYS MORE

Anglo American Investment Trust, is the diamond share holding company of the Anglo American group. It is notable that its profits have been stepped up quite considerably although its 1959 accounts will only contain De Beers higher interim for that year and not the substantially increased final that is now confidently expected next month. Anglo Trust holds 20 per cent of De Beers Deferred capital. The Trust will presumably have obtained higher revenue from its interests in the various diamond trading companies of the group in a year of record turnover in the stones. The total Anglo Trust dividend of 22s. 6d., which includes a bonus of 5s. in the final payment, compares with 20s. for 1958 when the bonus was only 2s. 6d. It seems that the present policy of the trust is to keep the dividend stable at 17s. 6d. (it has been this amount for four successive years now) and vary the bonus in accordance with the prosperity or otherwise of the industry.

With Vereeniging Estates we move on to the colliery interests of the Anglo American group. This concern's investment portfolio consists largely of South African coal shares. Improving rail transport in that country has helped the coal industry there while pithead prices were allowed to be raised modestly by the Government Price Controller at the end of October, 1958. So Vereeniging has been able to increase its profits slightly and to step up its dividend by 6d. to 8s.

SOUTH AFRICAN GOLD MINING RETURNS FOR JANUARY

Sharp profit increases abounded in the January kaffir returns—partly the result of new advances in milling rates or grades, but partly attributable to the comparatively low results returned for the short December working month.

Among the most notable results is that of Western Holdings, where an improvement against the trend in December was capped by a further advance of £60,478 in January. Behind this improvement was a new record throughput of 147,000 tons. At Hartebeest, on the other hand, rising costs caused a further fall in working profit to £537,683.

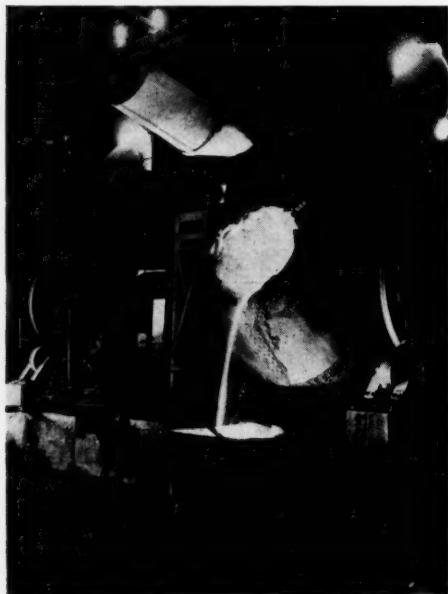
New peak profits were also announced by Doornfontein, Free State Geduld, Buffelsfontein, St. Helena and Winkelhaak.

Last month's gold price basis was 5d. higher at 250s. 4d.

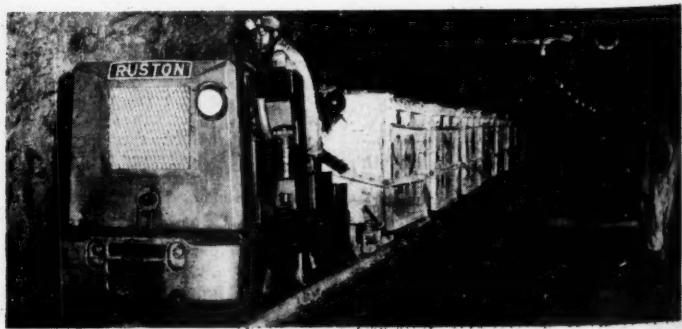
JOHANNIES' FIRST INTERIM

Breaking with tradition, Johannesburg Consolidated has declared a first-ever interim dividend of 1s. 6d. per share. This innovation was forecast by the board in the report and accounts published three months ago.

The rate of dividend declared gives little indication of the company's intentions with regard to a final payment. The chairman has stated that the total for the year should be at least maintained at last year's rate of 4s. 6d., but in view of the improved revenue from Johnnies' various interests, and the lower tax charge to be expected, most investors will be looking for a substantially higher payment.



A statement on their joint production and price policy issued by Rustenburg Platinum Mines of South Africa—the world's largest single producer—and its sole refiners and distributors, Johnson Matthey of London, was published in our issue of January 29, on pages 137-139. The statement, prepared by Mr. D. A. B. Watson, chairman of Rustenburg, reaffirms their joint policy to encourage the wider and continuing use of platinum, to ensure that it shall be in continuous and secure supply and that facilities are available both at the mines and in the refineries to increase output if this should be required. The illustration alongside shows an early stage in the smelting of Rustenburg platinum ore, while that below depicts a trainload of ore being hauled from the workings at Rustenburg Platinum Mines.



GUNNAR TAKES OVER DYNOM CONTRACT

Latest move in the consolidation of the Canadian uranium industry following the recent contract-stretching arrangements is a take-over by Gunnar Mines of the greater part of Canadian Dyno's contract with Eldorado Mining and Refining. An announcement by Dyno's vice-president, Mr. Louis Pancer, says that under the agreement, Dyno will close down by June 30.

Gunnar has already concluded an arrangement with Rayrock mines whereby Gunnar will supply Rayrock with sufficient ore to complete its contract. Rayrock had closed down through exhaustion.

HIGHLIGHTS FROM THE O.F.S. MEETINGS

Although this year's annual meetings of the five Anglo American O.F.S. mining companies could provide no sensations to compare with last year's disclosure of phenomenal values at Free State Geduld, Mr. Spiro, chairman of the companies, had important news to tell.

At the Western Holdings meeting, for example, he disclosed that further drilling is in progress on the farms Pretoriuskraal and Misrah south of the Vaal River. The

depth of 5,777 feet has been reached in one hole, P.K.9, and 2,334 feet in the other, M.P.1. No reefs have yet been intersected, but judging by the depth of other intersections in the vicinity a reef disclosure in P.K.9, at least, should be imminent.

The up-to-date development results announced by Mr. Spiro contained few surprises:

| Mine | % pay | in.-dwt. |
|--------------|-------|----------|
| F. S. Geduld | 97 | 1,192 |
| P. Brand | 94 | 933 |
| P. Steyn | 92 | 468 |
| Welkom | 79 | 420 |

NINE-FOR-ONE FROM NORTH BROKEN HILL

Subject to shareholders consent, North Broken Hill proposes a nine-for-one scrip issue, to be followed by a consolidation of the resulting ten 5s. shares into five 10s. shares. In effect, each stockholder will receive five shares of 10s. each in replacement of every 5s. stock unit held.

At the moment, North Broken Hill units suffer in popularity from being considerably higher in price than any other Australian lead-zinc producer. The proposed issue will, by reducing the unit of dealing to around the £1-25s. mark, remove this disability.

MARKET HIGHLIGHTS

After the previous week's short-lived attempt to embark on a new upward movement the South African Gold share market became listless once more. Even the appearance of some outstandingly good monthly profit figures in the January returns had little effect. About the only share to show much response to record earnings figures was West Driefontein with a rise of 2s. 6d. to 196s. 3d. Harmony improved slightly to 38s. 6d., but President Brand were a dull market at 79s. on last month's lower profit. Fears that the present dividend rate might not be maintained kept President Steyn subdued at 29s. 3d.

One of the few exceptions was provided by Vaal Reefs; news that the mine's No. 2 shaft had intersected good gold values on the Vaal reef touched off a Johannesburg and London demand which lifted the shares 3s. to 52s. 6d.

In the Finance group, "Osfits" at 110s. made a belated response to the previous week's higher dividend and "Johnnies" were reasonably steady at 78s. 9d. following the interim payment. Towards mid-week a feature was the Johannesburg demand for Anglo American Corporation which lifted the shares to a record 11½; the buying was inspired by hopes of good news in the final dividend and preliminary profits statement due in March. Similar reasons were behind the rise to 192s. 6d. in De Beers.

The Kennecott Copper labour settlement brought a sharp setback in the copper price and raised hopes that similar agreements could be expected shortly at Phelps Dodge and Anaconda. In view of Wall Street's continued downslide at the beginning of the week and some Paris selling caused by the Algerian crisis, it was hardly surprising that Copper shares moved smartly into reverse. A later tentative rally on Wall Street checked the fall in share prices here, but with the outlook still obscure the market remained very sensitive. Chartered, however, soon edged up to 113s. 9d. again on hopeful anticipations of the final dividend.

Tin shares stayed generally firm. Investment demand was particularly noticeable in Tanjong (25s.) and in Tronoh (30s. 3d.). But Southern Kinta eased to 30s. on the view that the company may be on the verge of heavy capital spending now that the question of transferring some of its dredges is becoming more important.

The lead-zinc share group tended to lose ground. In particular North Broken Hill encountered some profit-taking after the advance of 8s. 9d. to 126s. 3d. which had followed the announcement of a nine-for-one scrip issue; but after reacting to 123s. 9d. the price soon crept back to 125s. 7½d.

Elsewhere, the underground disaster continued to be reflected in the shares of Clydesdale Collieries which, after falling to 8s., recovered slightly to 9s.

BOARD CHANGES

Mr. J. D. McCall has been appointed a director of the Anglo-French Exploration Co. Ltd.



Mr. P. S. Hammond has resigned his seat on the Board of General Exploration Orange Free State Ltd., and Mr. J. M. M. Ewing has been appointed a director to fill the vacancy thus created.

FINANCIAL NEWS AND RESULTS IN BRIEF

Inco Raises Quarterly Payment.—At a meeting on February 1, the directors of the International Nickel Company of Canada raised the quarterly dividend to 75 c. per share. This is the first increase in the regular quarterly rate since 1955, when the rate was increased to 65 c. It is also proposed that the shares be split on a two-for-one basis.

Salaries Issue.—Of the £1,980,000 of 6 per cent notes offered at par to shareholders of South African Land and Exploration Co., subscriptions have been received in respect of approximately 89 per cent, leaving 11 per cent to be taken up by the underwriters.

Forum Offer for Naraguta Extended Areas.—Forum Mines, a private company operating a tin and columbite property in the Plateau Province of Nigeria, has made an offer of 1s. 10d. per share for the entire

capital of Naraguta Extended Areas. The Naraguta directors recommend acceptance. The offer closes on February 16.

Consolidated Tin Mines of Burma.—The offer made on behalf of Mr. B. Oberman to purchase the entire share capital of Consolidated Tin Mines of Burma at a price of 3d. per share has been extended to February 22. In the report and accounts of the company for the year to June 30 last, it is stated that if sufficient response to the offer is not forthcoming, the liquidation of the company will be recommended.

Benguela Railway Receipts.—Net operating receipts of the Benguela Railway Company in 1959 were 200,264,000 Esc., against 187,829,000 Esc. in 1958. Tons carried rose from 1,366,648 to 1,472,542. Tanganyika Concessions owns all the debentures and 90 per cent of the equity of the Benguela Railway.

ROAN ANTELOPE COPPER MINES LIMITED

NORTHERN RHODESIA

METALLURGISTS

Applicants must hold a degree or equivalent qualification and have experience in milling, flotation or allied operations.

Duties will cover practical operating and supervision in all sections of the concentrator.

Basic starting salary £1,092/1,320 per annum plus bonus, currently 33% on basic salary, and cost-of-living, pension, life assurance and medical schemes.

APPLICATIONS IN CONFIDENCE TO :

The Appointments Officer,
SELECTION TRUST LIMITED,
Mason's Avenue,
Coleman Street,
London, E.C.2. QUOTING R.2. M.J.

Company News

The registered offices of the H.E. Proprietary, Ltd., will be at 49 Moorgate, London, E.C.2, as from February 1. Tel.: MONarch 1020.

★

Gandy Ltd., of Cheshire, have asked us to state that they were not the manufacturers of belting supplied to the National Coal Board, which was stated at the enquiry into the disaster at the Auchengiech Colliery, to have been the cause of the disaster.

★

As from January 25, the address of The United Steel Companies will be (G.P.O. Box 64), The Mount, Broomhill, Sheffield 10. The telephone number remains unchanged at Sheffield 60081.

Helmet Factors require experienced Agent home - export.
Write to Box 655, *The Mining Journal Ltd.*, 15 Wilson Street, Moorgate, London, E.C.2.

DAVIES INVESTMENTS LTD., Bankers, still offer 7½ per cent on sums £20 to £500 (withdrawal on demand) with extra ½ per cent on each £500 unit. Details and audited Balance Sheet from Investment Dept. MN, Davies Investments Ltd., Danes Inn House, Strand, London, W.C.2.

MINING ENGINEER required for alluvial mining in MALAYA. Preference given to a qualified man with five years' practical experience. Salary to be in accordance with qualifications and experience. Write stating age, qualifications, experience and whether married or single to Box 987 Walter Skinner, Ltd., 20 Copthall Avenue, London, E.C.2.

MINING ENGINEER, 42, A.C.S.M., A.M.I.M.M., seeks position in U.K. Willing to make visits overseas. 20 years' mining experience same group. Recently head of Mining Department large copper mine. Excellent references. Replies to Box No. 654, *The Mining Journal Ltd.*, 15 Wilson Street, Moorgate, London, E.C.2.

The Proprietors of British Patent No. 700,577 for "IMPROVEMENTS IN OR RELATING TO PIT-PROPS AND SIMILAR STANCHIONS", desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2.

Rand and Orange Free State Returns for January

GOLD OUTPUT AND PROFIT

| Company | January 1960 | | | Year ends | Current Financial Year Total to date | | | Last Financial Year Total to date | | |
|-------------------|--------------|-------------|----------------|-----------|--------------------------------------|-------------|----------------|-----------------------------------|-------------|----------------|
| | Tons (000) | Yield (oz.) | Profit† (£000) | | Tons (000) | Yield (oz.) | Profit† (£000) | Tons (000) | Yield (oz.) | Profit† (£000) |
| Gold Fields | | | | | | | | | | |
| Doornfontein | 96 | 38,890 | 196·9 | J | 663 | 269,385 | 1334·7 | 613 | 255,769 | 1335·4 |
| Libanon | 112 | 26,391 | 64·6 | J | 775 | 182,065 | 434·6 | 161,910 | 279·5 | |
| Luipaards Vlei | 67 | 11,571 | 6·3 | J | 495 | 89,182 | 38·4 | 490 | 84,604 | 38·4 |
| Rietfontein | 16 | 4,245 | 7·6 | D | 16 | 4,245 | 7·6 | 16 | 4,348 | 8·0 |
| Robinson | 50 | 9,637 | 13·2 | D | 50 | 9,637 | 13·2 | 66 | 14,110 | 114·3 |
| Simmer & Jack | 77 | 13,840 | 11·9 | D | 77 | 13,840 | 11·9 | 90 | 17,200 | 11·2 |
| Sub Nigel | 66 | 15,265 | 17·9 | D | 460 | 108,938 | 137·9 | 463 | 111,680 | 175·4 |
| Venterspost | 129 | 32,582 | 65·2 | J | 884 | 223,536 | 430·1 | 892 | 222,295 | 408·6 |
| Vlakfontein | 51 | 18,220 | 86·1 | D | 51 | 18,220 | 86·1 | 50 | 17,929 | 85·5 |
| Vogels | 88 | 18,930 | 23·7 | D | 88 | 18,930 | 23·7 | 90 | 20,610 | 40·5 |
| West Drie | 115 | 105,241 | 912·9 | J | 740 | 677,173 | 5715·0 | 564 | 538,791 | 4405·9 |
| Anglo American | | | | | | | | | | |
| Brakpan | 142 | 17,268 | 13·4 | D | 142 | 17,268 | 13·4 | 140 | 16,500 | 11·1 |
| Daggas | 230 | 46,351 | 227·6 | D | 230 | 46,351 | 227·6 | 246 | 42,462 | 243·1 |
| East Daggas | 102 | 17,290 | 38·5 | D | 102 | 17,290 | 38·5 | 91 | 15,110 | 27·1 |
| F.S. Geduld | 95 | 81,941 | 667·8 | S | 376 | 320,518 | 2572·0 | 294 | 219,997 | 1605·8 |
| President Brand | 115 | 94,180 | 833·0 | S | 462 | 379,973 | 3362·1 | 385 | 289,712 | 2411·4 |
| President Steyn | 102 | 40,166 | 195·2 | S | 409 | 161,836 | 773·0 | 365 | 142,637 | 726·3 |
| S. A. Lands | 93 | 19,390 | 41·4 | D | 93 | 19,390 | 41·4 | 90 | 18,935 | 54·2 |
| Springs | 105 | 14,414 | 15·4 | D | 105 | 14,414 | 15·4 | 104 | 14,220 | 10·0 |
| Vaal Reefs | 94 | 42,300 | 226·9 | D | 94 | 42,300 | 226·9 | 78 | 35,491 | 200·0 |
| Welkom | 98 | 30,445 | 73·0 | S | 389 | 122,755 | 302·5 | 360 | 108,869 | 307·3 |
| Western Holdings | 147 | 97,755 | 823·4 | S | 561 | 367,021 | 2997·4 | 396 | 233,113 | 1763·8 |
| West Reefs Ex. | 134 | 37,660 | 129·3 | D | 134 | 37,660 | 129·3 | 110 | 28,051 | 75·4 |
| Central Mining | | | | | | | | | | |
| Blyvoor | 128 | 83,825 | 640·6 | J | 898 | 588,703 | 4469·2 | 731 | 480,168 | 3486·4 |
| City Deep | 109 | 22,897 | 7·1 | D | 109 | 22,897 | 7·1 | 117 | 24,445 | 12·1 |
| Cons. M.R. | 82 | 15,458 | 6·6 | J | 642 | 121,043 | 51·3 | 997 | 142,094 | 102·8 |
| Crown | 213 | 34,830 | 12·1 | D | 213 | 34,830 | 12·1 | 232 | 35,826 | 9·0 |
| D. Roodepoort | 196 | 35,580 | 52·6 | D | 196 | 35,580 | 52·6 | 190 | 34,694 | 53·8 |
| East Rand Prop. | 218 | 55,479 | 95·2 | D | 218 | 55,479 | 95·2 | 223 | 57,169 | 125·6 |
| Harmony | 150 | 60,163 | 264·9 | J | 993 | 395,000 | 1763·9 | 696 | 279,390 | 1099·6 |
| Modder East | 131 | 12,983 | L2·0 | J | 949 | 93,144 | 12·6 | 941 | 93,010 | 14·9 |
| Rose Deep | 27 | 4,464 | 0·6 | D | 27 | 4,464 | 0·6 | 38 | 5,619 | 10·6 |
| J.C.I.* | | | | | | | | | | |
| Freddies Cons. | 59 | 13,279 | L39·0 | D | 59 | 13,279 | L39·0 | 57 | 13,754 | L34·8 |
| Govt. G.M.A. | 50 | 10,856 | 0·6 | D | 54 | 10,856 | 0·6 | 64 | 10,958 | L8·1 |
| Randfontein | 25 | 4,717 | 3·2 | D | 25 | 4,717 | 3·2 | 29 | 4,808 | 5·1 |
| Union Corporation | | | | | | | | | | |
| Ast Geduld | 134 | 39,671 | 262·1 | D | 134 | 39,671 | 262·1 | 137 | 42,141 | 293·3 |
| Geduld Prop. | 75 | 13,949 | 32·5 | D | 75 | 13,949 | 32·5 | 72 | 12,790 | 13·2 |
| Grootvlei | 215 | 44,942 | 233·5 | D | 215 | 44,942 | 233·5 | 205 | 43,451 | 215·2 |
| Marievale | 99 | 24,181 | 125·0 | D | 99 | 24,181 | 125·0 | 90 | 22,857 | 107·9 |
| St. Helena | 155 | 51,150 | 312·8 | D | 155 | 51,150 | 312·8 | 140 | 40,741 | 211·3 |
| Van Dyk | 69 | 12,035 | 13·3 | D | 69 | 12,035 | 13·3 | 78 | 14,695 | 30·0 |
| Winkelhaak | 80 | 24,401 | 101·3 | D | 80 | 24,401 | 101·3 | 71 | 16,245 | 18·1 |
| General Mining | | | | | | | | | | |
| Buffelsfontein | 145 | 56,944 | 306·0 | J | 1,012 | 388,905 | 2051·7 | 843 | 285,197 | 1305·8 |
| Ellatton | 29 | 6,890 | 27·5 | D | 29 | 6,890 | 27·5 | 30 | 7,079 | 30·1 |
| S. Roodepoort | 30 | 7,236 | 22·9 | J | 210 | 50,111 | 160·1 | 210 | 49,710 | 167·7 |
| Stilfontein | 160 | 72,080 | 404·0 | D | 160 | 72,080 | 404·0 | 125 | 63,875 | 417·4 |
| W. Rand Cons. | 127 | 17,965 | 6·7 | D | 127 | 17,965 | 6·7 | 129 | 18,825 | 17·9 |
| Anglo Transvaal | | | | | | | | | | |
| Hartebeestfontein | 100 | 47,000 | 273·7 | J | 677 | 342,895 | 2141·3 | 608 | 333,100 | 2248·8 |
| Lorraine | 75 | 15,563 | L19·4 | S | 315 | 64,051 | L75·0 | 296 | 57,806 | L72·8 |
| N. Klerksdorp | 11 | 1,277 | L 5·4 | D | 11 | 1,277 | L 5·4 | 9 | 988 | L8·4 |
| Rand Leases | 175 | 26,512 | 19·1 | J | 1,308 | 194,822 | 166·8 | 1,263 | 183,749 | 85·7 |
| Village M.R. | 30 | 4,666 | 0·5 | J | 310 | 32,466 | 4·1 | 190 | 33,303 | 5·8 |
| Virginia O.F.S. | 133 | 30,058 | 26·4 | J | 933 | 213,527 | 124·7 | 779 | 202,658 | 284·0 |
| Others | | | | | | | | | | |
| N. Kleinfontein | 83 | 10,123 | 0·1 | D | 83 | 10,123 | 0·1 | 84 | 11,004 | 3·5 |
| Wit. Nigel | 19 | 4,395 | 5·4 | J | 119 | 30,577 | 35·8 | 125 | 30,227 | 42·8 |

Gold has been valued at 250s. 4d. per oz. fine. (December 249s. 11d.). L indicates loss. † Working Profit.

* Working Profit includes sundry revenue. Table excludes profits from Uranium, Pyrite and Acid, and also production from Uranium divisions at Luipaards Vlei, Randfontein and W. Rand Consolidated.

ESTIMATED URANIUM REVENUE

| Company | Year ends | Jan. Profit (£000) | This year (cum.) (£000) | Last year (cum.) (£000) | Company | Year ends | Jan. Profit (£000) | This year (cum.) (£000) | Last year (cum.) (£000) |
|--------------------|-----------|--------------------|-------------------------|-------------------------|-------------------|-----------|--------------------|-------------------------|-------------------------|
| Gold Fields | | | | | J.C.I. | | | | |
| Doornfontein | J | 16·0 | 103·0 | 105·0 | E. Champ d'Or (b) | D | 7·1* | 7·1* | 6·2* |
| Luipaards Vlei (a) | J | 94·0 | 652·0 | 628·0 | Freddies Cons. | D | 32·0* | 32·0* | 32·0* |
| Vogels | D | 55·0 | 35·0 | 52·0 | Govt. G.M.A. | D | 23·1* | 23·1* | 22·0* |
| West Drie | J | 50·0 | 350·0 | 322·0 | Randfontein (a) | D | 110·0* | 110·0* | 109·2* |
| Anglo American | | | | | General Mining | | | | |
| Daggafontein | D | 139·4 | 139·4 | 144·0 | Buffelsfontein | J | 213·0 | 1484·0 | 1378·0 |
| P. Brand | S | 46·3 | 183·2 | 192·0 | Ellatton | D | 17·0 | 17·0 | 20·0 |
| P. Steyn | S | 61·0 | 240·9 | 247·0 | Stilfontein | D | 93·0 | 93·0 | 90·0 |
| Vaal Reefs | D | 145·2 | 145·2 | 140·0 | W. Rand Cons. (a) | D | 211·3 | 211·3 | 197·9 |
| Welkom | S | 57·8 | 229·0 | 235·0 | Anglo Transvaal | J | 264·0 | 1836·6 | 1799·6 |
| West Reefs Ex. | D | 159·3 | 159·3 | 160·0 | Hartebeestfontein | S | 36·0 | 145·0 | 136·0 |
| Central Mining | J | 158·0 | 1080·4 | 1070·8 | Lorraine | D | 10·5 | 10·5 | 10·0 |
| Blyvoor | J | 212·0 | 1377·0 | 1004·9 | N. Klerksdorp | D | 176·7 | 1239·1 | 1300·7 |
| Harmony | J | | | | Virginia O.F.S. | J | | | |

Table includes profit from uranium, acid and pyrite before loan redemption. (a) Total profit from uranium section. (b) Overall profit. * Net revenue after provision for loan redemption.

Technical Briefs

High Intensity Magnetic Separation of Iron Ores

The basic design of high intensity induced rotor magnetic separators has been studied by Palasvirta who has shown that the shape of the pole pieces and the type of rotor surface have considerable effect on the efficiency and operation of the machine.

Many machines employ a sharply receding pole face but this has been shown to be inferior to other designs since there is considerable loss of flux due to bridging, thus bypassing the narrowest separating zone. Furthermore, there should be a fairly long zone of high field intensity as well as a consistent concavity of the surface facing the rotor. A profile similar to that in the illustration has been found to be the best. Similarly triangular teeth or ridges rather than square teeth produce the maximum attractive force.

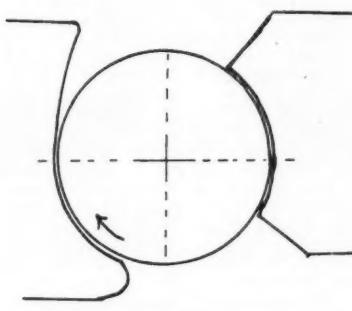
Rebounding of non-magnetic particles from the pole face into the concentrate can affect the purity of the concentrate and this tendency naturally increases as the rotor speed is increased. If however, the feed rate is increased to the maximum the separator will receive, the stream of particles in the separation zone becomes so dense that apparently contamination by rebounding gangue particles ceases.

HIGH TENSION SEPARATION IN DRESSING JIG CONCENTRATE

An interesting account of work done using high tension separation for the treatment of columbite-bearing concentrate derived from the decomposed granite of the Jos Plateau, Nigeria, was presented at the Institution of Mining and Metallurgy meeting (November 19, 1959), by F. A. Williams.

Apart from the normal practice in such high tension separation and its application on this particular material which was thoroughly described giving ample detail, the paper is of value since it relates the specific gravity of the minerals involved, and their particle size, to the operation. Since a number of relatively high specific gravity minerals are involved, about some of which there is little published information, the effect of sizing and other feed preparation is particularly interesting, when there are small differences in the conductivity of the minerals to be separated.

For such separations, it is necessary to closely size the feed and this is essential for effective separation of magnetic zircon and magnetic orangite from columbite and cassiterite. Furthermore, separation is only effective over a certain size range and the author shows that feeds which are the products of reversed or counter classification such as is produced under the action of a flowing film of water give better results on the material used in the experiments and it is suggested that in extreme cases, depending on the particle size and the specific gravity of individual minerals, greatly improved separations may be achieved by such feed preparation.

**Ideal pole pieces**

In fact, results are presented which indicate that the separation of cassiterite from xenotime and zircon would be appreciably better with a counter-classified feed than with a screen sized feed. Consequently for any particular concentrate, the relative advantages of screen sizing classification and counter or reversed classification should not be overlooked.

Another interesting point is that it has been found necessary to heat the feed to about 100-110 deg. C. to achieve the best separation.

At the same meeting *Metalurgical Accounting and Control* was discussed by M. L. Fitzgerald in which systems of control and accounting are considered as well as the limitations of the various weighing, measuring and sampling methods with their ranges of error. In view of the importance of achieving economic and efficient operation the author suggests that more emphasis should be placed on this subject in the training of graduate metallurgists.

URANIUM ASSAYING

Over 21,000 chemical uranium assays have been run by Sargent Geochemical, of 829 East 4th St., Casper, Wyoming, United States. This probably sets a record for the number of chemical uranium assays by paper chromatography. The company decided to use paper chromatography after considerable study of other methods of uranium analysis. Titration methods were too slow, too costly, and resulted in greater accuracy than was necessary for exploration and mining purposes. Fluorescence methods were very fast and very cheap but could never be trusted because of the possibility of the presence of quenchers or enhancers. Paper chromatography is fast and cheap and within tolerable limits of accuracy. Another advantage is that the same method can be used to assay the entire range of uranium concentrations from 1 part per billion to 100 per cent uranium. Furthermore, when using paper chromatography approximate lime and pyrite content of the sample can be observed and recorded when the acid is added and boiling is started.

The accuracy is tailored to fit the requirements and the degree of speed necessary. On multiple runs of ore assays where accuracy is important the error can be held to about ± 5 per cent, but that cuts down speed to about 40 assays per man day. About 90 ore assays per man day is the company's normal speed and error is about ± 10 per cent which is satisfactory for exploration and mining purposes. This degree of accuracy can be maintained even when the tests are being performed by non-technical personnel.

Assays for uranium content in water are much slower; only about 24 samples can be run per man day, and the error is about ± 40 per cent, but as little as one part per billion of uranium in water can be detected. Only 500 ml. of water is needed but to get a litre is preferable in case the test has to be repeated.

By contrast, about 200 drill cuttings can be assayed per man day with about a ± 30 per cent error. Ore assays are run on all cuttings assaying in excess of 0.005 per cent U_3O_8 . Soil samples take a little longer because they have to be ashed, cutting the maximum rate down to about 150 samples per man day with a ± 30 per cent error. Error is no problem in soil assaying because geochemical uranium anomalies are usually 500 to 1,000 per cent above background.

The company has developed quite a few innovations to the methods published in U.S. G.S. Bulletins 1036J and 1036L. These innovations have made it possible to use paper chromatography for ore assaying and have increased accuracy, sensitivity and speed.

NEW PLANT RECOVERS TUNGSTEN, TIN AND PYRITE

With rising costs and the need to treat lower grade ore, the mining industry must attempt to recover minerals which might otherwise be wasted and the ingenious flowsheet proved at Climax Molybdenum for recovery of tungsten and tin as well as pyrite is a pointer to the inevitable trend. Although the main economic mineral at Climax is molybdenite amounting to about 0.4 per cent in the average ore, some 0.03 per cent of WO_3 , 1.25 per cent of pyrite and a trace of cassiterite are also present.

After the molybdenite has been recovered by flotation, the higher specific gravity minerals are first concentrated in banks of Humphreys spirals. This concentrate is then treated by flotation to remove the bulk of the remaining pyrite using rubber-lined Climax-Weining machines and employing ethyl xanthate in a pulp at a pH value of 5.0.

Flotation tailing is next concentrated on Deister tables and the monazite removed by a further flotation stage using Armac C as collector and pH value of 1.2, the pulp being treated to 100 deg. F. for the operation. Starch is added to depress the Hubnerite. The monazite rich concentrate is tabled to remove a cut of low grade tungsten concentrate and the residue for the flotation from which the monazite has been removed is

passed through a low intensity magnetic separator to remove metallic iron, after which the dried material is treated on Ding cross-belt separators making a tungsten (Hubnerite) concentrate. Finally a small quantity of cassiterite is removed from the non-magnetic fraction by means of further table concentration.

In this way two grades of tungsten concentrate assaying 72 per cent WO_3 and 40 to 50 per cent WO_3 , respectively and a low grade tin concentrate assaying about 40 per cent are made.

By next spring Transariyona Resources Inc. hopes to have the first commercial "segregation" plant in operation in N. America on their property in Arizona. The process, originally patented many years ago, and used for the treatment of mixed oxide-sulphide ores, utilizes heating to 500-800 deg. C. in the presence of a halide salt and a solid reducing agent resulting in the formation of particles of metallic copper which are subsequently separated from the waste by froth flotation.

BERYLLIUM WORK AT A.W.R.E.

Beryllium is the subject of an intensive research programme started by metallurgists of the Atomic Weapons Research Establishment, Aldermaston, in 1953. Whilst beryllium has many properties which make it a serious contender with titanium in certain fields, the ductility of beryllium varies according to its metallurgical condition and under certain conditions it behaves with little or no ductility. This feature is not characteristic of metals and could seriously restrict beryllium's potential applications.

A.W.R.E. researchers have already made considerable progress in understanding the anomalous ductility values and have developed conventional technological methods for fabricating the metal under conditions to yield the optimum metallurgical properties. Casting and powder metallurgy techniques have been developed together with extrusion and rolling processes as methods for fabricating rod, tube and sheet. Various methods for joining have been successfully developed and include electron-beam welding, argon arc welding and flame brazing.

A detailed description of this work, carried out at Aldermaston, is being prepared by A.W.R.E. for display at the Engineering Materials and Design Exhibition, to be held at Earls Court, London, from February 22-26, 1960.

AUTOMATIC CONTROL OF EFFLUENT NEUTRALIZATION

An interesting account of the method employed to render a chemical plant effluent innocuous before discharge, has been described in which the pH is continuously adjusted by means of a pneumatic controller and depends on a jet of air which is interrupted by a flag on the meter when the set value has been reached. This has the advantage that the metering side remains quite independent of the transmitter, and no special pneumatic transducer is required as in the case of electrical measurement.

★

A recent patent specified 8-quinolinol as a collecting agent for columbium minerals such as pyrochlore, niocatite and betafite. (U.S. Patent 2875896.)

Associated Electrical Industries Ltd. in 1959

The reorganization of Associated Electrical Industries Ltd. on a product basis was carried a stage further on July 1, 1959, when five new divisions—Electronic Apparatus, Motor and Control Gear, Switchgear, Traction, and Transformer—came into operation. On January 1, 1960, the complete reorganization was concluded by the formation of three management companies, A.E.I. (Manchester) Ltd., formerly Metropolitan-Vickers Electrical Co. Ltd., A.E.I. (Rugby) Ltd., formerly British Thomson-Houston Co. Ltd., and A.E.I. (Woolwich) Ltd., formerly Siemens Edison Swan Ltd.

Five further product divisions were also announced, bringing the total number of divisions to twelve. The new formation maintained a traditional service to the mining industry in the U.K. and overseas.

A reduction in capital investment in the mining industry has resulted in the placing of fewer orders than in previous years. On the other hand, erection and commissioning of winding equipment already ordered have proceeded steadily. Winders of the medium range of horsepowers have been most affected by the financial restrictions. Several contracts have, however, been secured for the supply of underground haulages. The decision of the N.W. Division of the N.C.B. to extend the Mosley Common No. 3 winder (commissioned by Metropolitan-Vickers in 1954) is one such example. This winder is now to be fitted with two additional 2,250-h.p., d.c. motors which will make four winder motors with a total r.m.s. rating of 9,000-h.p. and give a winding capacity of 550 tons of coal per hour from a depth of 2,950 ft.

During the year a number of orders for winders using mercury-arc converters were received. These include a 1,400-h.p. winder for operation in the No. 5 shaft of the National Coal Board's Hucknall No. 2 Colliery. During the year, four winders with mercury-arc rectifiers were commissioned.

Overseas mining business has shown some increase and includes a contract for forty 50-h.p. flameproof squirrel-cage motors (Type KF) required for driving underground conveyors which are being supplied by the Mining Engineering Co. Ltd. to the National Coal Development Corporation of India. Selection Trust Ltd. have placed new business on behalf of Mufulira Copper Mines Ltd., Rhodesia, who require four 365-h.p., 1,470-r.p.m. squirrel-cage motors (Type RSP) for primary gyrator crushers.

For the Roan Antelope Copper Mines Ltd., N. Rhodesia, Selection Trust Ltd. require two 1,660-h.p., 1,475-r.p.m. squirrel-cage motors (Type AMS) for pump drives. The Anglo American Corporation of South Africa Ltd. have ordered a 1,000-h.p., 1,485-r.p.m. slipping motor (Type AMW) for the N'Changa Consolidated Copper Mines Ltd., Northern Rhodesia.

An order has been received from the Selection Trust Group for an ore winder in No. 14 Shaft at Mufulira West Mine, Northern Rhodesia. This winder, which will be driven by two 3,325-h.p., 350-r.p.m., 720-volt d.c. motors, will be installed during the latter half of 1960. The order includes a 4,800-h.p., 500-r.p.m. synchronous motor to drive two 2,400-kW. generators

supplying this winder. A service winder for No. 12 shaft has also been ordered. The equipment will comprise a Ward-Leonard controlled balanced skip winder, driven by two d.c. motors with a total r.m.s. rating of 2,650 h.p. Mechanical parts will be supplied by Fullerton Hodgart and Barclay Ltd.

Selection Trust has also ordered a winder for Peterson No. 2 shaft at Mufulira, and manufacture is in progress at Trafford Park of the 2,150-h.p. winder motor and 1,560-kW. motor-generator set.

The Anglo American Corporation of South Africa have placed an order for Western Reefs (No 4 Shaft) for a 5,200-h.p. a.c. winder with dynamic braking. A.E.I. Export Ltd. is the main contractor for the complete winder installation, and mechanical equipment is by Vanderbijl Engineering Corporation, South Africa, to a design of Vickers-Armstrongs (Engineers) Ltd. An order has also been placed by General Mining, on behalf of the Stilfontein Gold Mining Company (Scott Shaft) for a 5,200-h.p. a.c. winder with dynamic braking. The same sub-contractors are responsible for the mechanical equipment, which is also identical to that ordered for the Western Reefs No. 4 Shaft. Also in South Africa, the largest twin-motor winder ever manufactured has been successfully commissioned at the Saaiplaas mine of New Consolidated Goldfields Ltd. This winder is the first in the Union to employ Lamex closed-loop control. It has a total r.m.s. rating of 6,700 h.p. and a peak rating of 14,200 h.p. A duplicate winder is being commissioned at the same mine.

At Great Boulder Mines in Australia the first of two 1,100-h.p. Ward-Leonard "Lamex" closed-loop winders has been commissioned. This is the first of its kind in Australia.

Norway's largest producer of aluminium, Ardal og Sundal Verk, who propose to increase their capacity by 32,000 tons a year, have ordered germanium rectifiers with a total output of 108-MW., 800 volts 135,000 amp. for electrolysis in a smelter. The installation, believed to be the largest of its type ever ordered, is to be commissioned early in 1962. One of the earliest applications of A.E.I. germanium rectifiers was for copper refining, and the total capacity of the equipments for this purpose now exceeds 11,000 kW. The latest order, from Semcongo for Union Miniere du Haut Katanga in the Belgian Congo, is for two installations, each rated 81 kW., 45/20 volts, 18,000 amp.

Rectifier equipments despatched during the year include eight pumpless mercury-arc rectifiers for mine-winder drives, seven of them for the National Coal Board. The eighth equipment is rated 816 kW., 800-0-800 volts, 1,020 amp. r.m.s. and is to the order of New Consolidated Goldfields for their Venterpost mine, where it will be installed underground.

Victor Products Ltd. have placed continuation orders for 1,460 stator and rotor units required for building into coal drilling units for the N.C.B. Other N.C.B. business includes the continuation orders for a further nineteen 90 h.p. specially modified flameproof squirrel-cage motors (Type KF) for driving compressors (Armstrong Airbreakers) for service at the coal face.

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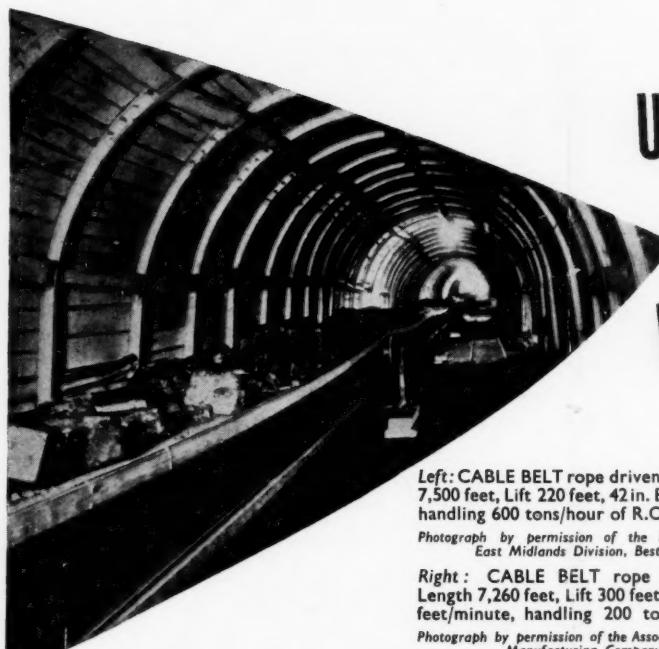
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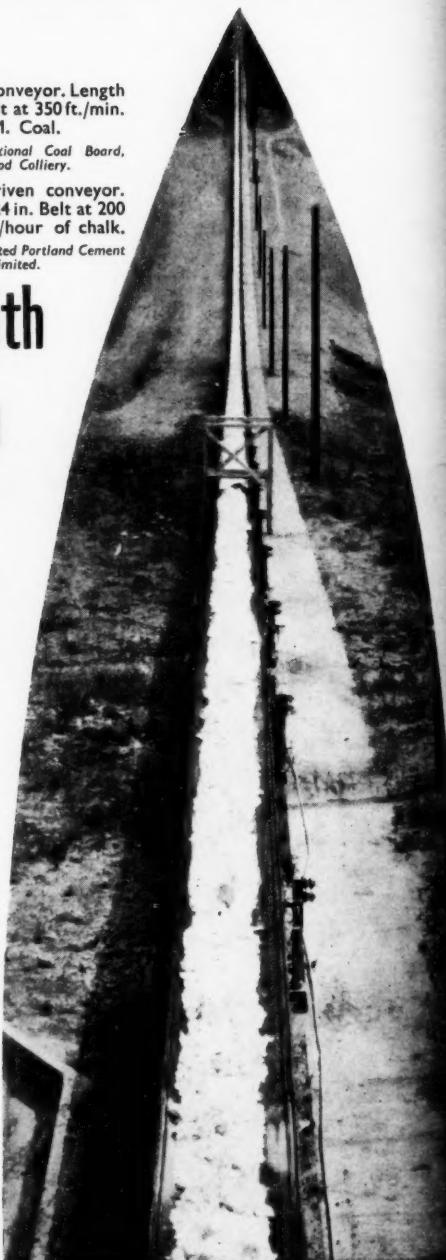
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